AMOTIVATION TO AUTOMATICITY IN ADULT PHYSICAL ACTIVITY:

A MIXED-METHODS INSTRUMENT DEVELOPMENT PROJECT

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Keywords: amotivation, automaticity, motivation, physical activity, self-regulation

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Abstract

This dissertation explores self-regulatory constructs related to the initiation and maintenance of habitual physical activity in adults for instrument development purposes. The developing measure is designed for use in longitudinal research on the progression from sedentary behavior to habitual physical activity that meets or exceeds federal minimum recommendations. A second measure, designed for recruitment of participants who may show a "sudden gain" pattern has also been created. Because the accrual of reliability and validation evidence is an ongoing process, this dissertation project is defined as a four-step, mixed-methods instrument development project involving: 1) phenomenological method qualitative interviews designed to discover and/or refine constructs related to behavioral, emotional, cognitive and habitual aspects of self-regulation as associated with physical activity and exercise. 2) an initial item pool, created and refined by the research group, 3) The initial item pool further refined by a layperson's refinement survey 4) The refined item pool for the full-range instrument and for the "sudden gain" recruitment screener has been made ready for online administration for the purpose of exploratory factor analyses. These versions of the full-range and recruitment instruments will be amenable to post-dissertation psychometric evaluation using a community sample.

Keywords: amotivation, automaticity, motivation, physical activity, self-regulation

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List of Abbreviations

AAAPAQ: Amotivation to Automaticity in Adult Physical Activity Questionnaire

AAEM: Adult Amotivation for Exercise Measure

AERA: American Educational Research Association

APA: American Psychological Association

BMI: Body Mass Index

BREQ: Behavioral Regulation in Exercise Questionnaire

BREQ-2: Behavioral Regulation in Exercise Questionnaire, Revised

CDC: Centers for Disease Control and Prevention

CVR: Content Validity Ratio

EFA: Exploratory Factor Analysis

FMR: Federal Minimum Recommendations (for physical activity)

IPAQ: The International Physical Activity Questionnaire

METS: metabolic equivalent units

NCME: National Council of Measurement in Education

NHIS: The National Health Interview Survey

PASOCQ: Physical Activity Stages Of Change Questionnaire

QOL: Quality of life

RCT: Randomized controlled trials

SDT: Self-Determination Theory

SRBAI: Self-Report Behavior Automaticity Index

SRHI: Self-Report of Habit Index

SMD: Standard Mean Difference

SME: Subject matter expert

SOC: Stages of Change, associated with TTM

TTM: Transtheoretical model

Definition of terms

Amotivation: lack of self-determination with reference to manifestation of target behavior.

Automaticity: a behavior, or the decision to behave, is considered "automatized" when it is frequent, done with little or no conscious control, awareness, or intent, and thus involves very low self-regulatory effort.

Body Mass Index: An index of weight relative to height, calculated by this formula: [weight (lb.) / [height (in)]2 x 703]

Decisional balance: an index created by a ratio of advantages to disadvantages ("pros and cons") of change in the targeted behavior.

Exercise: structured, planned, and repetitive sets of physical activities that are engaged in for the enhancement of physical health or performance.

Habit: A recurrent pattern of behavior acquired through frequent repetition, often done with little or no conscious effort. In the literature habit and automaticity overlap, but the implication of automaticity is that automatized behaviors are less vulnerable to relapse than are habits.

Motivation: Internal and external factors related to desire and energy in people to engage in a behavior.

Obligatory Exercise: Also called “Excessive Exercise,” a maladaptive pattern of excessive exercise and/or physical activity similar to that seen in drug dependence; time and other resources spent on exercise are above the norm, negative emotions are associated with the need to exercise, impairment of other life function may develop, and as exercise is used to stabilize emotion, more exercise will eventually be needed to create a sense of having done enough.

Physical activity: Any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level.

Practice element: a specific clinical technique or strategy (in psychotherapeutic settings), as contrasted with a manualized treatment.

Sedentary behavior: Sitting or reclining (not standing or moving major muscle groups)

Self-determination theory: a theory of motivation based on the idea that conditions of autonomy, competence and relatedness create the most effective motivation.

Self-efficacy: the belief that one can successfully engage in a specific behavior.

Self-regulation: a complex and multifaceted process in which alteration or replacement of undesirable current response sets is undertaken.

Sudden gain: a nonlinear, rapid, or “catastrophic” pattern of change in manifestation of physical activity behaviors and self-regulatory patterns.

Amotivation to Automaticity in Adult Physical Activity: A Mixed-Methods Instrument Development Project

A body of literature has emerged on associations between physical activity (including sedentary behavior), physical health, and psychological health. Researchers have developed several theoretical and empirically-derived models and have identified factors that account for significant proportions of variance in physical activity behavior. Sedentary behavior is also beginning to be recognized as having effects distinct from physical activity and as such research with a primary emphasis on its effects and determinants is becoming more common. The aim of this instrument development project is to begin the process of creating an empirically validated, reliable measure suitable for longitudinally tracking the self-regulatory progress of people who are trying to develop a life-long habit of exercise and/or physical activity as they move along a continuum from sedentary or non-habitual physical activity to habitual behavior that is so firmly entrenched that it may be categorized as occurring due to automatic processes.

The ability to consciously and voluntarily regulate one's behavior is of central importance to the initiation and maintenance of habitual health-related behaviors such as exercise. Self-regulation is complex and multifaceted process (Baumeister & Heatherton, 1996; Beauregard, Levesque, & Bourgouin, 2001) in which alteration or replacement of undesirable current response sets is undertaken (Oaten & Cheng, 2006). Although several questionnaires have been designed to assess specific models or constructs, many potentially valuable cognitive, emotional, environmental, and behavioral self-regulatory factors have not been fully researched. Further, no questionnaires that longitudinally

assess a broad set of self-regulatory factors for the individual who is progressing from being primarily sedentary through development of habitual physical activity has been found by this author. The proposed instrument development project will use qualitative and quantitative methods to initiate the creation of such a measure.

Definition of "physical activity"

The United States Department of Health and Human Services Physical Activity Guidelines (2008) defines *physical activity* as "Any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level. In these Guidelines, "physical activity" refers to the subset of bodily movements that enhance health (United States Department of Health and Human Services, 2008, p. 53)." *Exercise* is a form of physical activity that is typically defined as a structured, planned and repetitive set of physical activities that are engaged in for the enhancement of physical health or performance (Caspersen, Powell, & Christenson, 1985; Ceria-Ulep, Tse, & Serafica, 2010). Although exercise and physical activity have different formal definitions, because exercise is a form of physical activity, the term "physical activity" is now typically used to refer to both types of activity (Ceria-Ulep et al., 2010; National Center for Health Statistics, 2013; United States Department of Health and Human Services, 2008). The current study adopts a definition of physical activity that is consistent with those in the United States Department of Health and Human Services Physical Activity Guidelines (2008), and with the National Center for Health Statistics Survey definitions: "movement accomplished by the contraction of skeletal muscle that increases energy expenditure and that enhances physical health". As suggested in the

Field Manual of the National Interview Health Survey, the term “physical activity” will include physical activity done at work, during leisure time, and during structured exercise (United States Census Bureau, 2013).

A broad range of physical activities that are not “formal exercise,” yet are adequate for the purposes of improving physical and mental health, as well as meeting federal minimum recommendations will be queried in the qualitative interviews. For this project all physical activity above a moderate level of intensity will be used to classify each participant as a) habitually meeting or exceeding federal minimum recommended physical activity levels, b) habitual physical activity that meets federal minimum recommendations except for one type of physical activity, or c) those who do not regularly meet federal minimum recommendations. “Moderate intensity” is described by the Centers for Disease Control and Prevention as “working hard enough to raise your heart rate and break a sweat. One way to tell is that you'll be able to talk, but not sing the words to your favorite song.” (Centers for Disease Control and Prevention, 2015).

Federal Recommendations for Physical Activity

The current federal minimum recommended levels of physical activity as stated in the Centers for Disease Control and Prevention’s “Physical Activity for Everyone: Adult Guidelines” website are:

1) A newer recommendation is that adults should avoid inactivity, and some physical activity is better than none.

2) “2 hours and 30 minutes (150 minutes) of moderate-intensity aerobic activity (i.e., brisk walking) should be performed in episodes of at least 10 minutes, and should be spread throughout the week, and moderate-intensity muscle-strengthening activities should be done on 2 or more days a week that work all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms), OR

2) 1 hour and 15 minutes (75 minutes) of vigorous-intensity aerobic activity (i.e., jogging or running) every week and moderate to high-intensity muscle-strengthening activities on 2 or more days a week that work all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms), OR

3) An equivalent mix of moderate- and vigorous-intensity aerobic activity and muscle-strengthening activities on 2 or more days a week that work all major muscle groups (legs, hips, back, abdomen, chest, shoulders, and arms)” (Centers for Disease Control and Prevention, 2015).

Compliance with Recommended Physical Activity

Federal campaigns in the United States have advocated health benefits of physical activity since the 1950’s, yet many people in the United States still fail to meet minimum federal recommended levels (Centers for Disease Control and Prevention, 2013; President’s Council on Fitness, Sports, and Nutrition, n.d.; Schoenborn, Adams, & Peregoy, 2013). The National Health Interview Survey (NHIS) for 2012 found that fewer than one in five people met the United States federal recommendations for both aerobic and muscle-strengthening activity. The Survey also reported that approximately only

fifty percent of adults in the United States get sufficient aerobic activity as defined in the NHIS Field Manual (National Center for Health Statistics, 2013, pp. 215-219). Studies of overall physical activity suggest that over the last 50 years, the United States population's overall levels of physical activity have declined. Researchers have proposed that the decline may be due to changes in the workplace and built environment (Brownson, Boehmer, & Luke, 2005: Church et al., 2011).

The Relationship between Physical Activity and Physical Health

This section will review literature about the physical health-related effects of sedentary behavior, standing behaviors which are typically work-related, and exercise/physical activity.

Health risks of sedentary behavior. Americans spend an average of 7.7 to 8.5 hours a day sitting – at computers, in cars, watching TV, etc. (Evenson, Buchner, & Morland, 2012; Matthews et al., 2008). An emerging body of research suggests that even for those who exercise sufficiently, high levels of sedentary behavior are a distinct risk factor for all-cause and cardio-vascular mortality, as well as a risk factor for Diabetes II and other health problems (Kim et al., 2013; Peddie et al., 2013; Thorp, Owen, Neuhaus, & Dunstan, 2011; Van der Ploeg, Chey, Korda, Banks, & Bauman, 2012; Yates et al., 2012).

A dose-dependent positive relationship between time spent in sedentary behavior and incidence of health problems has been found in several studies (Ford & Caspersen, 2012; Healy et al., 2008; Katzmarzyk, Church, Craig, & Bouchard, 2009; Lee & Skerritt, 2001;

Martin, Church, Thompson, Earnest, & Blair, 2009). Persons who spend more than four hours a day in sedentary behavior are at an elevated risk for health problems, compared to those who spend 4 hours or less in sedentary activities. Men who reported over 23 hours a week of sedentary behavior were 82% more likely to die of a cardiovascular event than were men who reported less than four hours a week (Ford & Casperson 2012; Warren et al., 2010). It should be remembered that this is associational research and the effects of illness and sedentary behavior are likely to be bi-directional.

Although some studies have found that controlling for Body Mass Index (BMI), which is an index of weight relative to height,) attenuates the relationship between average daily time spent in sedentary behavior and mortality rates, two large sample longitudinal studies (Katzmarzyk et al., 2009; Van Der Ploeg et al., 2012) found that controlling for BMI did not significantly weaken this relationship. Van der Ploeg et al., (2012) analyzed physical activity data from the "45 and Up" study in Australia (sample size: 22,497 men and women, age's $\geq$ 45 years). They controlled for sex, age, marital status, smoking status, physical activity, education, BMI, long-term illness and/or disability, and rural vs. urban residency. Cox proportional hazard regression models for relative risk revealed that all-cause mortality rates were significantly associated with hours a day spent sitting (Van Der Ploeg et al., 2012). Similar methodology and findings are also reported in the Katzmarzyk et al., (2009) study of 12 years of data collected with the Canada Fitness Survey. They found that sedentary behavior was positively related to all-cause mortality rates except for cancer. Addition of BMI to this model as a covariate did not significantly reduce the strength of the relationship between sedentary behavior and mortality

(Katzmarzyk et al., 2009). Although these are associational data, many authors consider this and other evidence to support recommendation of reducing the amount of sedentary behavior in addition to emphasizing the need for appropriate amounts of physical activity (Biddle, O'Connell, & Braithwaite, 2011; Gardiner, Eakin, Healy, & Owen, 2011; Hamilton, Healy, Dunstan, Zderic, & Owen, 2008; Kim et al., 2013; Matthews et al., 2012; etc.).

Not quite sedentary: Standing. Research findings on the health benefits of standing vs. sitting in the workplace have been mixed. Prolonged standing in the workplace has long been associated with health problems such as varicose vein formation, lower limb edema, and pain in feet, legs, and lower back (Balasubramanian, Adalarasu, & Regulapati, 2009; McCulloch, 2002). Pain and circulation problems are especially associated with "stationary standing," in which one stands with minimal movement for long periods in one place (Antle & Cole, 2013; Balasubramanian et al., 2009). In contrast, standing that allows changes of position, such as "dynamic standing," or "standing/walking," is usually associated with situations or tasks for which the worker is standing the majority of the time, but is intermittently required to walk short distances (Balasubramanian et al., 2009; Duvivier et al., 2013). In a 12-year epidemiological study of Canadian adults, increased standing time was associated with reduced all-cause and cardiovascular disease-related mortality (Katzmarzyk, 2014).

Benefits of physical activity for physical health. Several researchers have found robust positive associations between levels of physical activity and physical health (Lee & Skerrett, 2001; Löllgen, Böckenhoff, Knapp, 2009; Martin et al., 2009; Reiner,

Niermann, Jekauc, & Woll, 2013; Williams, 2013). Reiner et al., (2013) reviewed longitudinal studies with at least five years of follow-up and found that physical activity was significantly and negatively related to weight gain, obesity, the incidence of coronary heart disease and stroke, the incidence and development of type 2 diabetes, and mortality related to heart disease. Preliminary data also suggest that physical activity may have a protective effect against the development of dementia and Alzheimer's Disease (Reiner et al., 2013) and that it is inversely related to all-cause mortality (Löllgen et al., 2009) and the incidence and severity of Diabetes Mellitus II (Reichkendler, et al., 2012; Reiner et al., 2013).

Benefits of Physical Activity for Psychological Health

Empirical literature also has emerged on relations between physical activity and psychological health. Researchers have examined associations between physical activity and positive psychological functioning and the efficacy of physical activity as an intervention for behavior problems.

Physical activity and positive psychological factors. Reed and Buck (2009) conducted a meta-analysis of 105 studies that addressed the effect of physical activity on positive affect. All studies analyzed involved baseline measures of affect prior to interventions designed to increase the amount of physical activity. The average effect size (ES) for intervention vs. control group effect on positive affect was .57 with a standard deviation of .48. Findings included statistically significant relations between, and large ESs for, positive affect and exercise frequency (d_{corr} = .79), and positive affect and exercise intensity (d_{corr} = .72). Ten- to 12-week moderate intensity physical activity

programs resulted in the most improvement of positive affect (d_{corr} = .63) (Reed & Buck, 2009).

Many studies have reported statistically significant relations between self-reported quality of life (QOL) and various measures of physical activity, for persons who are well and those with medical problems. Gillison et al., in their 2009 meta-analysis of QOL in clinical and well populations used weighted, estimated ESs and found differences in the amount of physical activity and psychological (small ES = .21) and physical (small ES = .22) QOL for the well participants, as well as in overall QOL (small ES = .27) for those in rehabilitation after surgery (Gillison, Skevington, Sato, Standage, & Evangelidou, 2009). Martin et al. (2009) conducted a six-month randomized controlled trial and found that improvement on all measured quality of life variables (except bodily pain) was significantly associated with physical exertion categorized by expended kilocalories per kilogram of weight. Participants were assigned to groups that expended an estimated 50%, 100% and 150% of current federal physical activity recommendations. These findings of exercise dose-dependent improvement in quality of life were independent of weight change (Martin et al., 2009).

Physical activity and psychopathology. A variety of methods have been used to study physical activity as an intervention for psychopathology. The following sections address effects of physical activity on anxiety and depression.

Anxiety. Jayakody, Gunadasa, and Hosker's (2013) reviewed studies in which physical activity was an intervention for anxiety. They found that although physical

activity as a stand-alone treatment did not significantly alleviate anxiety, it did account for variance over that accounted for by talk therapy treatment or medication alone. Moreover, these authors found significant differences in pre-post treatment reduction of symptoms of panic disorder, social anxiety, and overall anxiety were found when physical activity was used as an adjunct intervention (Jayakody, Gunadasa, & Hosker, 2013). Wegner et al., in their 2014 meta-analysis, found that the average effect size for the anxiolytic effects of exercise was d =.34, but they noted that methodological differences between studies and the availability of few good-quality randomized controlled trials (RCTs) suggest that results should be viewed cautiously (Wegner et al., 2014).

Depression. The most recent Cochrane Collaboration reviews of exercise as a stand-alone treatment for depressive disorders (Mead et al., 2008 - 2010; Cooney et al., 2013) have consistently found a significant moderate effect of exercise compared to no treatment. However, these reviews identified methodological issues in many of the qualifying studies, such as inadequately concealed randomization, lack of blinded outcome assessors, and inadequate lack of adequate control for the effects of social interactions associated with exercise programs. The 2013 update analysis of 35 RCT studies compared exercise as a treatment to various other treatments and no-treatment controls (Cooney, et al., 2013). Results included a standard mean difference of -.62 for the overall pooled effect sizes attributed to exercise, with moderate heterogeneity (I^2 = 63%). However, when including only RCT studies with allocation concealment, intent-to-treat analyses, and blinded outcome assessment, the number of studies included was

reduced from 35 to six and the effect size became non-significant (d = -0.18). One weakness of the articles reviewed in the Cochrane reviews is that the authors did not analyze exercise combined with psychotropic medical or psychological treatments (Mead et al., 2008 - 2010; Cooney et al., 2013).

Review of physical activity as an add-on treatment in combination with psychological and/or psychopharmacological treatment was done by Mura, Moro, Patten, and Carta, (2014), who reviewed 13 studies, 11 of which were RCTs. All 11 RCTs included groups that received physical activity as an "add-on" or adjunct treatment to antidepressant treatment. These studies compared the combined physical activity/medication groups to anti-depressant alone, and/or to "other" treatment, and in one case, to a no-treatment control group. Nine out of the 13 studies showed statistically significant differences in depression scores between the combined treatment group and the other groups, suggesting that combined activity/medication treatments were more effective in reducing depression than were anti-depressants alone (Mura et al., 2014).

To conclude, engaging in regular physical activity at appropriate intensity levels correlates positively with measures of physical health. Physical activity when applied as a stand-alone intervention for persons with symptoms of depression and anxiety has had mixed results, however as an add-on treatment regular physical activity has been shown to be significantly associated with reduction of depression and anxiety symptoms as an adjunct to talk therapy and/or medication (Blake , Mo, Malik, & Thomas, 2009; Chandwani et al., 2014; Duijts, Faber, Oldenburg, van Beurden, & Aaronson, 2011;

Gillison et al., 2009; Jayakody et al., 2012; Martin, 2009; Mura et al., 2014; Reed & Buck, 2009; Wegner et al., 2014).

Self-Regulatory Factors Associated with Habitual Physical Activity

Creating a valid assessment instrument requires items that are relevant to and representative of the targeted constructs (Haynes, Richard, & Kubany, 1995; Haynes, Smith, & Hunsley, 2011). A questionnaire to measure the full range of self-regulatory factors that are relevant to initiating and maintaining physical activity should include constructs and factors supported by prior research. In the following sections, review of empirically supported factors associated with physical activity is done.

In the following sections empirically supported factors that are associated with physical activity.

Self-Regulatory strategies/behavioral processes. One of the factors most often reported to be significantly associated with changes in amount of routine physical activity is effective use of strategies that facilitate initiating and maintaining physical activity. Researchers often study these strategies as the "behavioral processes," initially developed in the Transtheoretical Model (TTM) literature (e.g., Lewis, Williams, Martinson, Dunsiger, & Marcus, 2013; Napolitano et al., 2008). These processes may be considered practice elements when regularly practiced in-session, or as strategies when self-developed, suggested to, or taught to participants by clinicians or experimenters.

Self-regulatory processes. Rhodes and Pfaeffli, in their 2010 review of determinants of physical activity, defined self-regulatory processes as planning (including

implementation intentions (Andersson & Moss, 2011), scheduling, and self-organizational behaviors. Sixteen of the twenty-two studies reviewed analyzed self-regulatory processes, but only eight found significant intervention effects, and only four of those did mediation analyses. Two of the studies showed a significant mediating effect of self-regulatory processes on increasing physical activity, but two studies did not find a significant mediating effect (Rhodes & Pfaeffli, 2010).

Planning. The clusters of behavioral processes discussed above all include, at least implicitly, some form of planning (time management, reminding oneself, stimulus control, etc.). Other researchers have addressed planning for physical activity directly. Scholtz, Schüz, Ziegelmann, Lippke, and Schwarzer (2008) parsed planning into two types. First, "action planning" which is said to occur after intention is formed, and which addresses specific information about "when, where, and how" (p. 1) a person will engage in physical activity. The second type of planning is "coping planning" which involves anticipating of obstacles and developing strategies to overcome them. Scholtz et al., used structural equation modeling to test the degree to which participation in vigorous physical activity was associated with the following latent factors: self-efficacy, outcome expectancy, risk awareness, behavioral intention, and action and coping planning. In the model that was used to test whether planning had an effect separate from intention, coping planning statistically significantly accounted for an indirect effect of intentions on physical activity (Z_{sobel}: 3.23, $p < .001$), and explained variance with this model was 23%. The next model tested prediction of change in vigorous physical activity. History of physical activity was included in this model and was the strongest predictor, but intention

and coping planning remained statistically significant predictors of change in physical activity (p = .02) (Scholtz et al., 2008).

Harley et al., In her qualitative study of maintenance of physical activity in adult African American women, Harley et al. (2009) found that "flexible planning" was important to those who successfully maintained their physical activity routine. Although "scheduling" and "planning alternates for missed sessions" were consistent themes, flexibility in planning and the ability to "remain dynamic in response to daily interruptions" (p. 106) were the two factors most often associated with adherence to physical activity routine (Harley et al., 2009).

Behavioral/cognitive-behavioral processes. Lewis et al. (2013) conducted an RCT to test behavioral processes as mediators of physical activity change interventions. The behavioral processes included substituting alternatives, enlisting social support, rewarding yourself, committing yourself, and reminding yourself. Changes in behavioral processes were reported as indirect effects of intervention on physical activity at follow-up, and they significantly mediated change in physical activity at six (ab = 27.29, SE = 7.96) and at twelve months (ab = 34.89, SE = 14.59) (Lewis, et al, 2013).

Napolitano et al. (2008) studied the effectiveness of the same set of behavioral processes in changes in physical activity, and found similar results, plus two other interesting findings. First, Napolitano et al., found that neither self-efficacy nor decisional balance were significant mediators of physical activity behavior change. Second, the path coefficient for the effect of cognitive processes (increasing knowledge

and health opportunities, understanding benefits, caring about consequences to others, and warning regarding risk) on change in physical activity at 12 months was *negative* (b_2 = -.29, 95% CI = -.48, -.10). Napolitano et al. suggest that cognitive processes are a "suppressor" variable in the relationship between behavioral processes and physical activity, and that the suppressor effects occur because they are not always supported by effective behavioral processes, but perhaps Lewis et al.'s (2013) RCT finding that lower *change* in cognitive processes was associated with greater physical activity at 12 month follow-up provides an explanation for the "inconsistent mediation effect" (MacKinnon, Krull, & Lockwood, 2000) that was found by Napolitano et al. The implication may be that active cognitive processes need not be used except during initiation of physical activity or to stave off relapse. This pattern would be consistent with descriptions of automaticity in the "Automaticity" section below.

Greaves et al., examined reviews of studies of both dietary and physical activity interventions. These interventions included a total of 23 different behavioral change strategies grouped as "established behavior change techniques." The following behavior change techniques were found to be associated with increases in physical activity: prompting practice, self-monitoring, individually tailored information/counseling, goal-setting, time management, and self-talk (Greaves et al., 2011).

Self-efficacy. Self-efficacy is often defined as the belief that one can successfully engage in a specific behavior (Olander et al., 2013). More complete definitions of self-efficacy include other descriptors, such as confidence in one's ability to execute actions required to achieve specific outcomes, the amount of challenge that is perceived to be

acceptable when setting goals, and as how persistent one is when working toward goals (Higgins, Middleton, Winner, & Janelle, 2014).

Self-efficacy and other self-regulatory factors are measured in ways that sometimes overlap. In the context of physical activity, the construct of self-efficacy may include sub-constructs. Within a single study, authors might include items that operationalize self-efficacy in several different ways - self-efficacy for knowing how to do the required bodily movement (i.e., 'Do you know how to do jumping jacks?'), or for the ability to maintain a physical activity routine, or for the ability to overcoming obstacles to routine physical activity such as time management, scheduling, fatigue, etc., (Higgins et al., 2014; Bray, Gyurcsik, Culos-Reed, Dawson, & Martin, 2001; and others). The way context specific types of self-efficacy are operationalized and measured suggests overlap with measures of strategy use, self-monitoring, and use of other behavioral processes. For example, consider Olander's et al., 2013 review of intervention studies designed to increase self-efficacy for exercise. These authors found that many of the behavioral change techniques used in the studies to increase self-efficacy were significantly associated with levels of physical activity (d = .50) but not with levels of self-efficacy. However, four of the techniques (action planning, time management, prompt self-monitoring, and planning social support) were found to be significantly associated with increases in self-efficacy (d = .23), but only the latter two techniques were associated with increased self-efficacy and physical activity. Most of the techniques reviewed in Olander et al., have also been used as strategies or "behavioral processes" to directly increase physical activity, as described in the following section.

Motivation. Motivation (measured primarily as intention) is one of the most stable determinants of physical activity according to a meta-analysis by Amireault, Godin, and Vézina-Im (2013). Pooled analysis of baseline differences in motivation showed a significant difference (SMD = 0.65, $p = 0.0001$) between those who were still maintaining physical activity at follow-up and those who had relapsed (Amireault, Godin, & Vézina-Im, 2013), although directionality between baseline motivation and maintenance of habitual physical activity could not be attributed.

Rhodes and Pfaeffli (2010) reviewed twenty-two studies of interventions to increase physical activity in non-clinical samples and found that only eleven of the studies presented evidence of significant change in physical activity, and thus could report mediation analyses. Motivation was tested in two RCTs, only one (Rhodes & Pfaeffli, 2010) of which found a significant effect of the intervention. In this study, motivation significantly mediated change in physical activity. However, the follow-up was short: physical activity was measured at baseline, six weeks, and 13 weeks (Fortier, Sweet, O'Sullivan, & Williams, 2007).

Intrinsic to extrinsic motivation. Fortier et al., studied motivation under the aegis of Self-determination Theory (SDT), which divides motivation into five regulatory states: (1) Intrinsic motivation (inherent enjoyment of the behavior itself), (2) Integrated motivation (individual has strongly internalized reasons for behavior; does behavior because strongly considers it to be the right thing to do), (3) Identified motivation (behavior may not stem from enjoyment of the target, but because the results of the behavior are so important to personal goals, no external pressure is needed), (4)

Introjected motivation (behavior is done due to internalized pressures such as guilt, worry, or shame), (5) Extrinsic motivation (motivation that is externally driven). Amotivation, which is defined as lack of ability to be self-determined about engaging in a target behavior, is considered to be outside of the self-determination continuum (Deci & Ryan, 1985; Ryan & Deci, 2000).

Questionnaires based on SDT's intrinsic to extrinsic motivation continuum have been used to examine the relations between motivation and levels of physical activity, and thus to behavioral outcomes. For most SDT-based studies of the relationship between motivation and physical activity, the most robust findings are for the positive relationship between physical activity and intrinsic motivation that existed prior to the study (e.g., was high at baseline and remained high during the study (Rose, Parfitt, & Williams, 2005; Teixeira, Carraça, Markland, Silva, & Ryan, 2012; Thogersen-Ntoumanis & Ntoumanis, 2006). However, past studies tend to leave out participants for whom physical activity would be most beneficial – those who do not regularly meet minimum physical activity guidelines, e.g., those who tend to be externally motivated or amotivated. Further research with such participants is needed.

Amotivation. Deci and Ryan (1985) defined amotivation as: lack of self-determination with reference to the manifestation of the target behavior. Although amotivation was originally researched in reference to inability to stop substance abuse (Deci & Ryan, 1985) it has since been applied to academic performance (Legault, Green-Demers, & Pelletier, 2006), physical activity (Markland & Tobin, 2004).

No meta-analyses or mediation analyses were found that include amotivation as one of the measured factors. This is understandable both because amotivation is difficult to validly measure, and because the more self-determined forms of motivation in the SDT continuum have the strongest support in the associational literature.

External environmental factors. External (e.g., not personally or internally-derived factors that influence self-regulation associated with physical activity) include environmental factors such as social support, demographic factors, and physical environmental factors. Although these factors are not the primary focus of this research, review of related literatures suggests that they may have a strong interactive influence on internally-derived self-regulatory efforts, and as such are of interest.

Social support. Social support is variably defined, most often as some form of encouragement to engage in a target behavior. Examples include: modeling of the behavior, agreement to engage in the physical activity as a partner or in a group, and verbal praise after physical activity has been done. Also, a more general form of perceived pressure to exercise, derived from the "subjective norm" has also been studied. Rhodes and Pfaeffli, in their 2010 review of the determinants of physical activity reviewed nine studies that included some form of social support intervention. Five of the nine studies included "subjective norm" pressure interventions and did not show significant change in exercise behavior. Mediation testing for interventions using more positive and personal social support interventions was only done in two studies, and only one study found that social support was a significant mediator (Rhodes & Pfaeffli, 2010). Booth, Owen, Bauman, Clavisi, and Leslie in their 2000 epidemiological study found that

several types of social support had strong associations with physical activity. Amount of overall social support and amount of family support for changes in appearance were analyzed by chi-square testing for active vs. inactive participants and found to be significantly different ($p = 0.010$ for both tests). Chi-square testing for differences in frequency of spousal physical activity ($p = 0.014$) and observation of participation of friends and family ($p = 0.001$) were also associated with increased exercise (Booth, et al., 2000). These findings were associational only, and causality cannot be attributed, however, the Litt, Keppinger, and Judge (2002) study of predictors from the Social Learning Model found that general social support in the previous 30 days before the start of the intervention was significantly associated with physical activity at three month follow up ($\beta = .21$, $t = 2.72$, and $p < .01$) and the only non-baseline variable that significantly accounted for increased physical activity at twelve months was "contemporaneous social support" ($\beta = .39$, $t = 2.30$, and $p < .05$) (Litt, Keppinger, & Judge, 2002).

Other external factors. Other factors that have been associated with physical activity include number of other obligations, especially those associated with the traditional female caregiving roles; proximity to facilities, weather, and employment outside of the home (Hefferon, Murphy, McLeod, Mutrie, & Campbell, 2013; Thomas, Halbert, Mackintosh, Quinn, & Crotty, 2012); and sociodemographic factors including age, gender, time constraints, and ethnicity (Brunet & Sabiston, 2010; Pavey et al., 2012; Thomas et al., 2012).

Obligatory exercise. A discussion of the full range of physical activity behavior will need to address exercise dependence, or obligatory exercise, which is a maladaptive pattern of excessive exercise and/or physical activity. In obligatory exercise, the individual displays a pattern of behaviors similar to that of dependence: time spent exercising is well above the norm (Yates, 1991), negative emotions are associated with the need for exercise (Ackard, Brehm, & Steffen, 2002; Anshel, 1991; Davis & Woodside, 2002; Mond, Myers, Crosby, Hay, & Mitchell, 2008), withdrawal symptoms and escalation of exercise behavior occur (Anshel, 1991; Hamer & Karageorghis; 2007), distress related either to inability to exercise enough, or to the inability to stop exercising even when one knows one should is reported, and impairment of physical, psychological and social functioning (Anshel,1991; Hamer & Karageorghis, 2007; Yates, 1991). Although prevalence of obligatory exercise is difficult to estimate because of lack of standardization of definition and measurement (Hausenblas & Downs, 2002) obligatory exercise in the general population has been estimated to be approximately 3% (Sussman, Lisha, & Griffiths, 2011).

Habit. Habit has been defined as a learned predisposition to repeat previous behavior, especially in response to frequently encountered contextual or internal cues (Wood & Neal, 2007). One important implication of habit is that it is considered to have become independent of the decisional and behavioral variability associated with reinforcement; a habitual behavior is much faster and more stable than are behaviors that depend upon reinforcement or cognitively-based intent (Hunt, Matarazzo, Weiss, & Gentry, 1979). Frequency of behavior, and contextual cues that facilitate behavior are not

sufficient to distinguish frequent behaviors from habitual behaviors. Habit also implies that manifestation of the behavior requires less deliberation and awareness than does the manifestation of non-habitual behavior (Lally, Wardle, & Gardner, 2011; Verplanken & Melkevik, 2008; and others), and as such, can be seen a condition that allows one to reduce needed self-regulatory resources, and to reduce the likelihood of relapse (Hunt, et al., 1979, Gardner, 2012).

Both sedentary behavior (Kremers, Van Der Horst, & Brug, 2007) and physical activity (Verplanken & Melkevic, 2008) are often considered to be habitual. Currently, one of the strongest predictors of future exercise behavior is past exercise behavior, and in the manifestation of exercise behavior, a trade-off between habit strength and needed strength of intent has been found (de Bruijn & Rhodes, 2011). Similarly, Conroy, Maher, Elavsky, Hyde, & Doerksen, (2013) studied determinants of sedentary behavior by comparing self-reported habit strength of sedentary behavior, actigraph-monitored sedentary behavior, and intention as predictors of sedentary behavior and physical activity. They found that habit had the strongest association with monitored sedentary behavior ($\gamma_{03} = 23.97$, $p = .04$), and intention to limit sedentary behavior was also significantly associated with reduction in sedentary behavior (r = -.23 to -.56) (Conroy, et al, 2013).

Habit and automaticity are similar constructs but are generally studied separately. Articles that primarily address automaticity will be reviewed next.

Automaticity. A behavior, or the decision to behave, is considered "automatized" when it is frequent, it is done with little or no conscious control, awareness, or intent, and thus involves very low self-regulatory effort (Bargh & Chartrand, 1999; de Bruijn, Gardner, van Osch, & Sniehotta, 2013; Orbell & Verplanken, 2010). A behavior that has become automatic requires fewer self-regulation resources than do non-automatic behaviors (which require conscious and effortful self-regulation), and an automatized behavior is less vulnerable to relapse than are behaviors that still require effortful self-regulation (Gardner, 2012; Rhodes, Fiala, & Nastui, 2012). Research by Orbell and Verplanken supports the idea that the decision to engage in physical activity (if not the behavior itself) can become automatic (Orbell & Verplanken, 2010), as can sedentary behaviors. It is important to note that although automaticity of a decisional process is generally defined as occurring in a state of low awareness, effort, and low consciousness of intent, these processes can become "subject to metacognitive reflection" (Verplanken & Melkevik, 2008, p. 17).

Automaticity of sedentary behavior. While no literature specific to the automaticity of sedentary behavior was found, a strong case for its habitual nature has been made by Conroy et al. (2013). Bargh and Chartrand (1999) suggest that regular use of goal-oriented cognition in stable contexts may cause conscious processes to become automatic processes. The strong relationship between leisure-time sedentary behavior with relaxing and/or reinforcing behaviors (television and movie viewing, video and computer gaming, and other computer behaviors) also suggests that automaticity of sedentary behavior is likely to develop (Kremers et al., 2007). Dombrowski and

Luszczynska (2009) theorized that the decline in levels of physical activity that occurs during adolescence is due to a decline in the spontaneous enjoyment-based automaticity of things like running and dancing, along with an increase in enjoyment-based automaticity of sedentary activities on computer (Dombrowski & Luszczynska, 2009), or other electronic devices. Automaticity of both sedentary behavior and physical activity (see next section) is of particular interest for this project because of our emphasis on creating a questionnaire about self-regulatory factors along the progression from sedentary behavior to long-term maintenance of habitual physical activity.

Automaticity of physical activity. Several researchers have addressed automaticity in physical activity. Verplanken and Orbell (2003) developed the Self Report of Habit Index Questionnaire (SRHI), which divides the concept of habit into repetition and automaticity. Verplanken and Melkevik, in their 2008 study of whether habit could be distinguished from frequency, found that the two did independently account for variance in exercise behavior and they stated that automaticity was "the defining feature" of habit (Verplanken & Orbell, 2003, p. 17). Rhodes and de Bruijn, in their 2013 review, noted that automaticity is one of the factors that moderates the intention-behavior discordance in physical activity (Rhodes & de Bruijn, 2013). One of the studies cited in that review used SEM to test three models of determinants of physical activity. They found that automaticity (as assessed with Verplanken and Orbell's (Self-Report of Habit Index automaticity items only), intention, and intensity of exercise (moderate vs. vigorous) were significant predictors of exercise. Perceived behavioral control and deliberation (rumination and speed of decision-making about exercise) did

not add significantly to the regression equations in any of the models. Perhaps most interestingly, a significant interaction between automaticity and intention to exercise was found. At low (β = 0.24, p = .001) and medium (β = 0.17, p = .002) levels of automaticity, intention was a significant predictor of physical activity behavior, but when automaticity is strong, intention is no longer a significant predictor (β = 0.09, p = .162) (Rhodes & de Bruijn, 2013).

Sudden gain in physical activity and sedentary behavior. In clinical psychology settings, sudden gain refers to a nonlinear "catastrophic" change and is most often associated with a rapid reduction of depression that occurs between one psychotherapy session and the next (Kelly, Roberts, & Ciesla, 2005; Tang, DeRubeis, Hollon, Amsterdam, & Shelton, 2007). Research on sudden gain has also focused on anxiety (Aderka, Nickerson, Bøe, & Hofmann, 2012), generalized anxiety disorder (Present et al., 2008), self-esteem (Clerkin, Teachman, & Smith-Janik, 2008), and Post Traumatic Stress Disorder (Doane, Feeny, & Zoellner, 2010). Although these rapid improvements may, to some degree, reverse in long-term follow-up, meta-analysis suggests that overall, sudden gain is associated with lower rates of relapse and better outcome (e.g., Aderka et al., 2012; Tang et al., 2007). This pattern of rapid change is seen as a contrast to conventionally expected pattern of a gradual, cumulative change in behavior as a result of cognitive deliberations and effortful self-regulation.

Others have written of rapid changes, although there is variability in the content and definitions of change. "Aha moments" and insight are often researched in problem solving literature and may also be seen as a product of incubation. An incubation process

is said to occur when one has been working hard and/or a long time on a problem, then takes time off from it, after which a solution suddenly occurs (Hélie & Sun, 2010). Insight and epiphanies are also important in clinical work (e.g., McDonald, 2007; Nowinski, 2004). Baumeister (1994) discussed crystallization of discontent: a cumulative cognitive and emotional understanding of the costs of problem behaviors and cognitions that needs to occur before life-change can be made (Baumeister, 1994). William Miller (co-creator of Motivational Interviewing) and Janet C' de Baca discuss patterns of sudden change described in case studies in their book *Quantum Change* (2001). They describe "quantum change" as a "vivid, surprising, benevolent and enduring personal transformation" (Miller & C' de Baca, 2001, p. 4). This type of change is reported to be sudden and enduring yet is described as an ongoing process. Miller and C' de Baca are careful to note that these sudden changes do not have merely cognitive substrates. The described changes involve cognition, emotion, and behavior (Miller & C' de Baca, 2001). Similarly, this instrument development project emphasizes both cognitive and emotional substrates of self-regulation for physical activity.

Research on antecedents to sudden gain has not resulted in clear findings. Demographic characteristics have not been systematically associated with undergoing sudden change (Aderka, 2012; Miller & C de Baca, 2001). Being in crisis ("bottoming out") is also not consistently associated with sudden gains; approximately half of those interviewed for quantum change experiences reported being in a crisis state (Miller, 2004). Some, but not other, authors have found that cognitive changes occurred in the session prior to change (Present et al., 2008). Baseline differences in the targeted

diagnosis, and number of sessions were not reliably associated with having a sudden gain, although single studies have sometimes reported these antecedents (Aderka et al., 2012).

Exploration of the possibility of sudden gain in physical activity-related behaviors (and its antecedents) is a primary aspect of this research project. In the case of habitual physical activity, anecdotal evidence suggests that occasionally there is a sudden shift in attitude, motivation, self-efficacy (perceived ability), and the amount of self-regulatory effort needed to maintain routine physical activity (personal communications with author). Sudden gain is expected to occur in either a positive (toward manifestation of healthy levels of physical activity) or in a negative direction (away from healthy levels of physical activity, and a cessation of the positive motivations, attitudes, self-efficacy, and easy self-regulation, e.g., a sudden perceived inability to maintain habitual physical activity, which is associated with confusion and distress surrounding perceived failure to maintain the desired behavioral routine. One of the primary purposes of the qualitative interview phase of this study is to find out whether participants report sudden gain change patterns. For physical activity sudden gain is expected to include shifts in the following factors:

Attitude shift. An attitude gain may involve an unexpected, rapid shift from negative to positive attitudes about the need for physical activity. For sedentary, amotivated people, a positive attitude about doing physical activity is speculated to be in contrast to their normal state of negative or avoidant attitude about doing physical activity although they are likely to endorse the importance of physical activity

(Morrisette, 2008). When attitudes about physical activity are negative, physical activity routines are felt to be unpleasant, and a generally unwanted obligation. For participants who are not sedentary, sudden gain may be a shift from a more neutral attitude to a positive attitude about doing a new activity, or increasing the frequency, duration or intensity of current physical activity.

Self-efficacy shift. Sudden gain for physical activity should be associated with a similar shift in self-efficacy, or the belief in one's ability to maintain habitual physical activity. This change may include increased willingness to plan for and use supportive strategies for maintenance of habitual physical activity. It may also include a shift away from the perception that strategies are not effective toward a belief that they will be effective.

Motivation shift. For those who have experienced a sudden gain in physical activity behavior that is reported to be accompanied by a sudden attitude change and a sudden shift in self –efficacy, it is expected that a sudden shift in motivation will have also occurred. For previously sedentary people motivation may shift from amotivation towards what is reported to feel more intrinsic motivation for physical activity. In addition, the long-term rewards of routine physical activity are expected to be reported as more salient than previously reported.

Self-regulatory effort shift. Sudden gains may also be associated with shifts in self-regulatory effort. After a sudden gain, physical activity is expected to be reported as requiring significantly less effortful self-regulation.

Behavioral shift. Perhaps most important, a behavior shift should also be apparent. This change might include a marked increase in physical activity behavior that meets or exceeds Federal minimum recommendations for type, intensity, duration, and frequency, and continues for several months, until a reversal in the sudden gain occurs.

Unfortunately, it is hypothesized that for those who are primarily sedentary, sudden gain shifts in motivation, attitude, and needed self-regulatory effort will often be temporary. Relapse of habitual physical activity to irregular and/or no exercise activity is expected to occur as the positive changes associated with the sudden gain reverse or fade. Confusion and distress are likely to accompany the person's perceived inability to maintain their exercise routine. This process will also be explored in the qualitative data collection portion of this study.

Current Measures of Self-Regulatory Factors Associated with Physical Activity

The primary factors of interest for this proposed study are self-regulation factors that may be associated with individuals' progression from sedentary (or minimal) physical activity behavior to levels of habitual physical activity that meet or exceed federal minimum levels of physical activity. A variety of measures have been developed that assess most of the factors separately, e.g., one instrument may measure of motivation, or another of behavioral strategies. Most of these questionnaires measure factors that are associated with a specific theoretical foundation such as Self-Determination Theory, Theory of Planned Behavior, or the Trans-Theoretical Model, have shown utility for research and intervention, and are widely used. However, the large number of determinants and self-regulatory factors associated with facilitation of physical activity

means that an unwieldy number of questionnaires would be needed to assess all of the factors that may be pertinent to the successful longitudinal progression from unhealthy to healthy habitual levels of physical activity. It is beyond the scope of this dissertation to address all of the relevant measures, so those that are of interest in this project and/or that will later be used to assess validity will be addressed here.

Motivation questionnaires (including amotivation). Several questionnaires have been created to address motivation for physical activity, but the most often cited are based on Self-Determination Theory.

Motivation questionnaires. The Behavioral Regulation in Exercise Questionnaire (BREQ) is one of the most widely used measures of the hypothesized continuum from intrinsic through extrinsic motivation for exercise (Mullan, Markland, & Ingledew 1997). Evidence of the reliability and validity of the BREQ has been collected in many studies. Cronbach's alphas for the overall scale and the subscales are typically between .70 and .90, and evidence for validity is robust (Markland & Tobin, 2004; Mullen et al., 1997; Mullan & Markland, 1997; Thogersen-Ntoumani & Ntoumanis, 2006). Unfortunately, as noted previously, the most robust findings for the BREQ are for participants who report high levels of intrinsic motivation for physical activity, thus the BREQ is less useful for predicting physical activity for those individuals who are less rather than more motivated to exercise. The BREQ-2, which includes an amotivation subscale, is discussed in the next section.

The Transtheoretical Model of behavioral change was originally developed to focus strictly on behavior rather than on specific theoretical conceptualizations of behavior, however this model led to the empirically-derived Stages of Change (SOC) conceptualization of behavior, which is also considered to measure type motivation to change. SOC has generated a vast body of literature on health-related change, including physical activity. Five stages that are related to readiness to change have been labeled: 1) Precontemplation (no intention of habitually doing physically activity for fitness), 2) Contemplation (considering becoming physically active at recommended levels within the next 6 months), 3) Preparation (preparing for routine physical activity, and/or doing less than the minimum), 4) Action (routinely meeting the recommended levels of physical activity for less than 6 months), and 5) Maintenance (meeting or exceeding recommended levels for physical activity for 6 months or longer). The Physical Activity Stages of Change Questionnaire (PASOCQ) is a 4-item short-form questionnaire (derived from a longer SOC questionnaire) that is scored using the answer pattern to determine an individual's stage of change for physical activity. It has been widely used and evidence for test-retest reliability (Kappa = .78) and convergent validity has been gathered in several studies on adults (Marcus, Rossi, Selby, Niaura, & Abrams, 1992).

Amotivation questionnaires. The initial version of the BREQ included an amotivation subscale. The authors eliminated that sub-scale due to poor psychometric properties. Then they revised and improved the intrinsic through extrinsic subscales and included an amotivation subscale (the BREQ-2). The amotivation subscale, however, has remained problematic (Markland & Tobin, 2004) with restricted response ranges (Mullan

& Markland, 1997) and skewed and 'strongly skewed' response distributions (Markland & Tobin, 2004; Mullan & Markland, 1997).

As part of a larger instrument development project, Morrisette (2008) analyzed amotivation items from the BREQ-2 and other amotivation subscales using verbal protocols, during which participants were asked to "think aloud" while answering the items, to access item response processes. Many of the amotivation subscale items were found to have actually accessed knowledge about exercise rather than motivation. For example, the Behavioral Regulation in Exercise Questionnaire-2 item "I can't see why I should bother exercising" (Markland & Tobin, 2004) activated more response considerations that reflected knowledge of the importance of exercise than it did emotional or motivational responses (Morrisette, 2008). In another part of the study, the BREQ-2 amotivation subscale items were analyzed using exploratory factor analysis and were found to have ceiling effects for almost all respondents. Scores on these items had low variability across all groups of respondents and these items did not distinguish between exercisers and non-exercisers. These findings might help to explain the psychometric problems found in the BREQ-2 amotivation subscales.

In another part of the Morrisette (2008) study, items that showed strong, distinct loadings in the factor analyses, and items that Subject Matter Experts rated as "necessary" were used to create the Adult Amotivation for Exercise Questionnaire (AAEQ). The factor that accounted for the most variance (55.8%) and that was stable across all of the analyses was termed "amotivation" (it should be noted that this analysis included two exercise history items that loaded with the amotivation items). Examples of

items that strongly loaded onto the “amovitation” factor included “I often intend to exercise, but I usually don’t end up doing it” and “Exercise is a high priority for me at this time” (reverse coded) (Morrisette, 2008).

Another stand-alone amotivation questionnaire developed at approximately the same time as the aforementioned AAEQ was the “Amotivation Toward Exercise Scale - 2” or ATES-2 (Vlachopoulos, Letsiou, Palaiologou, Leptokaridou, & Gigoudi, 2010). The ATES-2 has strong factor loadings but widely variable kurtosis values (.50 - 13.44), and the only items that reliably predicted exercise behavior were three “capacity assessment” items. These three items have a primary stem that asks: “When you don’t want to exercise, why is that?” then provides a set of items, each of which is an answer to the question, for example: “because I am absolutely convinced that I will not manage to cope with the requirements of an exercise program.” Respondents then rate their agreement to each answer by selecting one option on a 7-point Likert scale anchored by “strongly agree” to “strongly disagree” (Vlachopoulos et al., 2010).

Automaticity questionnaires. Most questionnaires for automaticity as regards physical activity are variations of Verplanken and Orbell’s Self-report of Habit Index, which was initially created as the type of questionnaire that could be adapted for any targeted behavior.

Self-report of habit index. Verplanken & Orbell (2003) created the Self-Report of Habit Index (SRHI), which has twelve items, eight of which were written to assess elements attributed to automaticity: “unintentionality, uncontrollability, lack of

awareness, and efficiency" (Verplanken & Orbell, 2003, p 1317) of a behavior. Initial internal reliability was high (coefficient alpha $\alpha = .85$) as was test-retest reliability ($r = .91$, $p < .001$). Three principle components analyses revealed a stable 1-factor automaticity model that accounted for 38.4% of the variance in exercise behavior, and evidence of convergent validity was found (Verplanken & Orbell, 2003). Later studies have reported similar or better reliability and validity. The creators of the SRHI have adjusted item stems to assess a variety of habitual behaviors including exercise. The basic SRHI stem for physical activity "Exercise is something…" and examples of completion answers reflecting automaticity include: "I do automatically," and "I do without having to consciously remember." Respondents rate each answer on a 7-point Likert scale anchored by "agree" to "disagree" (Verplanken & Orbell, 2003).

Self-report of behavioral automaticity index. More recently, Gardner, Abraham, Lally, de Bruijn et al., (2012) used discriminant content validation analyses to test the consistency of expert assessment of whether each item in the SRHI is more consistent with literature-based definitions of habit or automaticity. Because 4 items were confidently and consistently rated as representing automaticity ($ts > 45.00$, $ps < .001$) a 4-item questionnaire designed to address only automaticity of exercise was created. Expert raters were at least 90% certain that the item assessed automaticity, so these 4 items became the Self-Report Behavior Automaticity Index (SRBAI). Gardner, et al., (2012) examined 34 datasets from 47 previously published articles that used the SHRI. Reliability and the correlations between SHRI, SRBAI, and behavior were analyzed. Internal consistency, as measured by Cronbach's alpha, was above .90 in over half of the

datasets, and the lowest reliability coefficient was .68. The SHRI and SHBAI had an r = .92 (p = 0.001) correlation across datasets. The SRBAI did not predict behavior as well as the SRHI; this is expected since items assessing frequency of the target behavior were considered to address habit, and thus were left out of the single-factor automaticity questionnaire. Although the Gardner, et al, 2012 study supports the idea that automaticity is an important concept, the SRHI frequency questions are needed for best prediction of behavior, and as such the SRHI will be used in this project (Gardner et al., 2012).

Need for a Measure of the full Physical Activity Continuum with Improved Constructs

Despite extensive research on determinants of physical activity, high quality studies using mediation analyses and replication studies are difficult to find. Variations in study design, different theoretical orientations and operationalization of factors, as well as frequent overlap of theories and constructs makes it difficult to synthesize research results. This variation also makes it difficult to evaluate the quality of evidence for effectiveness of interventions designed to improve physical activity, especially over the long-term. The quality and credibility of research findings are in part dependent on the validity of the measures used (Haynes, Smith, Hunsley, 2011). Intervention research will improve by (a) developing an instrument based on more a comprehensive set of factors that are potentially associated with initiating and maintaining physical activity, then (b) measuring those factors in valid and reliable ways.

Such an instrument would optimally include items that measure a broad range of self-regulatory factors that influence the behavioral, cognitive, and emotional processes

involved in an individual's changes in physical activity behavior during the process of moving from habitual sedentary behavior to habitual physically active behavior. Such an instrument could help researchers meet fundamental requirements for conducting high quality studies of determinants of healthy levels of physical activity. With further validation, the instrument could be used in applied assessment and intervention settings (Haynes, O'Brien, Kaholokua, & Witterman, 2012; Howard, Moras, Brill, Martinovich, & Lutz, 1996; Khoo, West, Wu, & Kwok, 2002; Marshall & Biddle, 2001).

Specific Goals of Dissertation

The goal of the proposed dissertation project is to create an initial version of a measure of self-regulatory factors associated with (a) reducing unhealthy levels of sedentary behavior, and (b) initiating and maintaining physical activity at or above federally recommended minimum levels. The specific goals of this dissertation include:

1. Conduct mixed-method qualitative and quantitative research to define and refine self-regulatory constructs related to differences in sedentary behaviors, and initiation and maintenance of healthy levels of physical activity and use the exploratory nature of qualitative interviews to begin to accrue evidence about whether a pattern of exercise behavior described above as "sudden gain" is reported by participants.
2. Develop a pool of initial items using Morrisette's (2008) master's thesis pilot research, combined with theoretical and empirical literature review, and using qualitative data collected during this project.

3. Refine the item pool and create an initial questionnaire through research group evaluations and by having laypersons rate the items' clarity and relevance through an online layperson's refinement survey.
4. From the data collected in the steps above, create an online questionnaire suitable for administration to a student body and/or a community sample for the purpose of conducting factor analyses to examine the psychometric qualities of the measure.

Method

This four-step project involves the collection of qualitative and quantitative data, and the development of an instrument to measure factors associated with self-regulation of sedentary behavior and physical activity. Step one involves an in-depth analysis of the qualitative data to explore self-regulatory factors that may influence sedentary and physical activity behaviors. Emphasis in this step was on exploring the variations in physical activity, sedentary behaviors, and detailed information on self-regulatory concerns as reported by participants. Further, quantitative data was collected to corroborate the qualitative data. Step two includes the use of qualitative interview data to drive development and/or refinement of self-regulatory constructs related to physical activity and sedentary behavior, and to generate an initial item pool. Step three includes refinement of the item pool by the research group members, followed by administration of the initial item pool in an online "Layperson's Refinement Survey" designed to assess the clarity and relevance of the items, and to refine wording and formatting as needed. Step four was the creation of a refined item pool using the data collected in step three.

This refined set of items is to be administered online for factor analytic purposes, although this step will not be part of the dissertation project.

For all of the steps and participants included in this project, the informed consent process and forms are congruent with requirements of the University of Hawaii at Manoa Institutional Review Board and the American Psychological Association's Ethical Guidelines for informed consent (American Psychological Association, 2002, 2010). Please see Appendix A for the consent forms used in this project.

Step One: Semi-structured Qualitative Interviews

Goal. The purpose of these interviews was to explore the habitual, emotional, behavioral and cognitive self-regulatory processes surrounding engaging in sedentary behavior and physical activity. Interviews were initially exploratory, then as the content of initial interviews was analyzed by the experimenter and research group, a stronger emphasis on the use of thematic content from previous interviews was used to derive and/or refine useful constructs and to analyze systematic variations in self-regulation physical activity.

A mix of qualitative and quantitative methods were used in these first steps of this project, as this approach is often used for identification and exploration of variables or constructs in instrument development (Archibald, Radil, Zhang, & Hanson, 2015; Creswell, Klassen, Plano Clark, & Smith, 2011). The qualitative inquiry step of this instrument development project was designed using a pragmatic phenomenological standpoint. Pragmatic qualitative research employs diverse approaches, including

qualitative and quantitative methods as needed to give primacy to answering the research question. It is focused on outcomes and is used by researcher-practitioners. Thus, after the interview questions were discussed, quantitative data were collected primarily to corroborate the qualitative data. Because phenomenological qualitative research involves interviewing several individuals about their "lived experience" of questions of interest (Creswell, 2013), this methodology was used to design our qualitative interviews. One strength of phenomenological research is that it allows researchers to base construct definition and refinement on the existing body of relevant literature, combined with a more intimate understanding of the "lived experience" of participants. This research can also be considered as having an exploratory sequential design, because the data from the qualitative interviews will be used to inform the later quantitative steps of instrument development. Integration of the various qualitative and quantitative data will be done during the initial data analysis phases.

The structure of the interview sessions was as follows: 1) the informed consent process, 2) the interview, 3) administration of the paper and pen form of the International Physical Activity Questionnaire (IPAQ), which measures both sedentary behaviors and formal and informal physical activities. Descriptive statistics were calculated using this information, including hours of daily and weekly exercise and sedentary behaviors, and 4) height was measured on a scale posted on the wall, and weight and percent body fat were determined by the Tanita bioelectrical impedance scale. Each participant's BMI was calculated using the formula: weight (lb.) / [height (in)]^2 x 703, as cited on the Centers for Disease Control and Prevention website (Centers for Disease Control and Prevention, 2017).

Participants. Participants included undergraduate students recruited from the University of Hawaii student body by the SONA System, which gives students extra credit for participation (See Appendix B for SONA System recruitment notice for this proposed study). Initially, there were no screening criteria for participants, However, as it became clear that only people with a history of habitual exercise or sports involvement were signing up, the eligibility requirements changed. Recruitment announcements were changed in an attempt to exclude strongly habitual exercisers and asked specifically for people who do not regularly exercise or do physical activity. When and N of 24 was reached without any sedentary or overweight participants having self-selected into the SONA participant pool, snowball sampling was used to find five additional participants, for a total N of 29. The 5 participants who were not recruited through the SONA System were given $10.00 as a thank you for their participation.

A total of 29 interviews were conducted. Participant age range was from 18 – 42 years old, with an average age of 23 years old. Participant ethnicity was diverse: 28% Caucasian, 28% Mixed (primarily Caucasian/Asian), 21% Filipino, 10% Japanese, and 1 person each of Chinese, Guamanian, Hawaiian, and Mexican ethnicity. There were 31% male (n = 9), and 69% female (n = 20) respondents. Please see Table 1 for other descriptive statistics for this sample. Body builders were reported as a separate group because their extra muscle mass creates an artifactual body mass index that incorrectly places them in the "overweight" category. Percent body fat is a convenient way to provide an index that will demonstrate that body builders and other athletes are not overweight (Okorodudu et al., 2010).

Table 1.

Qualitative Sample Descriptive Statistics

Group	Descriptive Data						
	n	Average Daily Hours Physical Activity	Average Daily Hours Sedentary Behavior	Average BMI	% Body Fat	Average Age	Gender
All Participants	29	2.9	7.0	25.1	24.1	22.4	31% M, 69% F
Normal weight as per BMI	21	3.2	7.0	22.8	20.1	21.5	31% M, 69% F
Overweight/obese as per BMI	5	2.6	7.4	34.9	44.0	27.0	100% F
Body Builders (BMI artifact)	3	2.2	6.9	28.6	19.3	22.3	100% M

Materials. A copy of the *qualitative interview*, including questions and probes (probes were to be used only as needed), can be seen in Appendix C. A thematic coding handbook and construct clarification handouts were initially created by this investigator using the research literature on the constructs. These coding materials were then iteratively expanded and refined using data from the participants' interviews. Please see Appendix D for coding materials, including the initial Coding Handbook, and the first and last Basic Coding Sheets. When significant changes were made, earlier interviews were re-coded using the revised coding handbook. Table 2 contains a list of the primary themes of interest.

Table 2.

Themes derived from qualitative data

Theme #	Theme	Subconstructs	Definition
1	Physical Activity Variation		
		Meets FMR	Regularly meets or exceeds federal minimum recommendation for physical activity, including cardiovascular and strength training activities
		Near FMR	Regularly meets or exceeds federal minimum recommendation for physical activity, except for one type of activity (usually this refers to strength training)
		Not at FMR	Does not meet federal minimum recommendation for physical activity most of the time
2	Amotivation		Lack of self-determination for regular manifestation of physical activity.

3	Automaticity	Behavior, or the decision to behave, is considered "automatized" when it is frequent, done with little or no conscious control, awareness, or intent, and thus involves low self-regulatory effort
4	Emotional Effects	Effects of emotion on physical activity behavior
5	Habit	Measured as childhood and adult participation in sports, exercise, and recreational physical activity. Emphasis on 3+ years of habitual physical activity that meets or exceeds FMR
6	Overdoing/Obligatory Exercise	Maladaptive patterns of exercise behavior
7	Sedentary Behavior	Measured as sitting or reclining when not sleeping; little or no regular exercise other than that needed for activities of daily life
8	Social Support	Variations in preference for types of social support and in effectiveness of social support

9	Sudden Gain	Sudden, often unexpected, shifts in attitude, motivation, and self-efficacy in regard to regular physical activity toward physical activity. Definition of construct requires accompanying shift in manifestation of physical activity behavior
10	Other/Of Interest	Patterns of interest that will not be directly used in this instrument development project

The initial qualitative interview questions were used to collect a physical activity history. Physical activity and sedentary behavior were defined within the interview to clarify their definitions for the participant, and to provide the experimenter with a detailed history of the participant's sedentary behavior and physical activity. Physical activity was explained to the participant in two ways: 1) "Structured exercise" was defined as physical effort that is engaged in specifically for the purpose of sustaining and improving physical health (including becoming more physically fit to better perform at sports or career) and is scheduled to happen at least three times a week. 2) "Physical activity" was defined as physical effort that occurs both during exercise and other activities such as shopping, recreational activities such as hiking, amateur sports, and bike riding, housecleaning, etc. Because the emphasis was on emotions and cognitions surrounding physical activity, the majority of the questions addressed the respondent's understanding of these subjects.

Quantitative data were collected after the interview questions were finished. After the interview, demographic information was collected, including age, sex, and ethnicity. Next, the International Physical Activity Questionnaire (IPAQ) was administered (see Appendix E for a copy of the IPAQ). The IPAQ is a widely used self-report measure of physical activity (including sitting behaviors) for either the last 7 days or for a "usual week." Data on the IPAQ's reliability and validity have been collected from studies in 12 countries. IPAQ data were not normally distributed and came from several sites, so pooled Spearman's ρ was used in reliability analyses. Reliability of the IPAQ Short Form was good (pooled $\rho = .76$) and equivalence between long and short forms was also good, with a pooled ρ of .67. These correlations were not significantly changed by whether the

questionnaire was used in its "7 day" or "usual week" form. The correlation between total amount of physical activity per week in minutes as assessed by the IPAQ as compared to the Computer Science and Acceleration (CSA) accelerometer data was "fair to moderate," ranging from ρ of .12 - .61, with an average ρ of .30 for the short forms (Craig et al., 2003).

Data analysis plan. Mixed-methods incorporate several aspects of both qualitative and quantitative methods, so an interdisciplinary approach to rigor in the analysis of the quantitative data was used, as per Elliot, Fischer, and Rennie (1999), and Creswell, et al., (2011). For this project, the following mixed-methods procedures were used: Owning one's perspective (positioning the researcher, or bracketing), situating the sample, triangulation of qualitative and quantitative data, grounding in examples, credibility (inter-rater reliability) checks, coherence, and thematic saturation (Creswell, et al., 2011; Elliot, Fischer, & Rennie, 1999; Francis et al., 2010).

Owning one's perspective (positioning the researcher/bracketing). In qualitative research knowledge is considered to be situated in context and constructed by the self; as such researchers are not expected to separate themselves from the research questions. It is accepted that the qualitative research questions are of personal interest to the researcher, and thus scrutiny of one's theoretical assumptions and personal biases must become a public aspect of the research. This assumption is in contrast to the older Husserlian idea that bracketing would allow the researcher to isolate his or her own pre-existing conceptual framework, and thus create enough objectivity to be able to see the data clearly and without bias (Creswell, 2013). Although reduction of bias is still a primary

goal, complete elimination of bias is no longer considered realistic. Rather, continuous reflexivity of the self and how it interacts the research is the goal. Reflexivity is defined as systematically self-monitoring the social and personal construction of one's life including biases, theoretical orientations, fundamental assumptions, and experiences with the topic of the research, and how they might impact the research process (Elliot et al., 1999). **"**Bracketing" is the act of publicly reporting the researcher's personal conceptual framework in the study itself, so that readers can judge for themselves the way data were collected and analyzed by the researcher (Creswell, 2013).

My personal and professional experiences with self-regulation led directly to my theoretical orientation as a psychological researcher. Perhaps the best indicator of my theoretical perspective in psychology is my emphasis of preconscious factors in self-regulation. As described in this dissertation, the idea of a "sudden gain" in the ability to be self-determined with reference to a desired habitual behavior is intriguing to me and has been since my undergraduate experiences as a "basic" cognitive researcher. "Aha moments," (Kounios, & Beeman, 2009), incubation in problem-solving, Baumeister's "crystallization of discontent" (Baumeister, 1994), sudden gain (e.g., improvement) in depression as per Tang (2007) and others, all have an element of mystery; why did they occur? Why did they occur at a specific time? Why don't they occur more often? What sort of antecedents should we look for? Why can't we consistently and effectively facilitate this type of effortless, and often prolonged change?

Most of the literature on this subject is suggestive of a cascade of pre-conscious mental and emotional processes that occur only under certain conditions. How do those who

successfully make a sudden enduring change, go from struggling with effortful attempts to self-regulate habitual unhealthy behaviors, to apparently relatively effortless manifestation of healthy behaviors – at least for a while? And why does this ability to be self-regulated often last several months, then suddenly fade just as quickly and mysteriously as it appeared?

Although these patterns can be described (in retrospect) by behavioral economic principles, I found myself unsatisfied with the "black box" explanations of behaviorism. I feel that psychology has an important gap in our knowledge of the antecedents and patterns of enduring change, which in turn, creates a gap in our targeted interventions for health-related behaviors such as eating, exercise, smoking and other substance abuse, and risky or violent behaviors.

I have a personal history with sudden, concurrent change in motivation, self-efficacy, amount of self-regulatory effort, and exercise behaviors. Four times in my life, for no consistently discernable reason, I have suddenly become able to exercise at or exceeding the federal minimum levels 3 – 5 times a week for at least several months in a row. Then, just as mysteriously as it occurred, this state of being able, *at last*, to do habitual, healthy exercise rapidly faded away in spite of my intention and efforts to maintain it, leaving me feeling distressed, helpless, frustrated, and feeling inferior. My efforts to purposefully create this type of change were also unsuccessful. Thus, I began to do research. The researcher-as-participant is an often-debated topic in qualitative research. In this study the researcher was not a participant per se but had experienced some of the phenomenon under investigation; thus, it is important to consider the advantages and disadvantages

when a researcher has a potential personal stake in the topic under investigation. The disadvantages include inability to overcome bias and potentially flawed assumptions about the topic. The advantages include having a more in-depth insight into the topic, and a greater ability to facilitate participant involvement in the topic (Creswell 2013).

Situating the sample. Situating the sample involves identification of demographic information and other important historical, social, or environmental factors that relate to the lived experiences of the participants. The data itself directs the researchers toward relevant factors. Basic sample demographic data were seen above, and more specific demographic and biographical data will be presented as each theme is discussed.

Triangulation. Triangulation is essentially the collection of corroborating data from sources other than the primary interview source (Creswell, 2013; Elliot, et al., 2015; Jonsen, & Jehn, 2009). In this project, triangulation of reported sedentary and physical activity history was achieved by comparison of the qualitative interviews with the quantitative data provided by the International Physical Activity Questionnaire (IPAQ), which measures both sedentary behaviors and formal and informal physical activities. Further each interviewee's height and weight were measured so that their Body Mass Index (BMI) could be calculated and compared with their percent body fat as measured by the Tanita bioelectrical impedance scale. These triangulation data are presented in tabular form in the Results section. Further, consistencies in the group data reported for each theme can be seen as supporting triangulation. For example, percent body fat will be seen to be lower for those who report habitual exercise at or exceeding Federal Minimum Recommendations than for those who report little or no exercise, etc.

Grounding in examples. Grounding in examples involves two primary techniques. First for each theme, or construct of interest, examples of supporting statements are extracted from the interview data and reported. Second, in mixed-method designs, descriptive quantitative data are collected and reported, then supported by examples from interviews. Both of these techniques were used in this project.

Credibility or reliability checks. Reliability of the coding was done in this project by the use of inter-rater reliability statistics. For 38% of the transcripts, independent coding of primary themes was done by two coders. Training in the coding process was done by the principal investigator. Each research group member first read the introduction section of the principal investigator's dissertation proposal to become acquainted with relevant literature-derived constructs. The use of a Coding Handbook which included descriptions of the variables and constructs of interest, and a "Basic Coding Sheet" was discussed with each research assistant. The Basic Coding Sheet contained each theme, and criteria for making a coding decision about whether, and how, the participant fit into one of the sub-constructs/categories associated with the theme. Because this was an iterative process the first Basic Coding Sheets had fewer themes than the later ones.

All four transcripts that were considered to report a full sudden gain pattern were coded by two of the research group, as were 3 transcripts with physical activity patterns that were unusually difficult to categorize. The rest of the 38% (4 transcripts) were randomly selected to be coded by two raters. Percent agreement was calculated using SPSS for all constructs and consensus estimates of inter-rater reliability were calculated using the

Cohen's Kappa statistic (Stemler, 2004), before discussion of discrepancies occurred. All discrepancies were discussed by the principal investigator and research group members until consensus was reached.

Coherence. Coherence is achieved when a clear framework is established for moving from significant individual statements (horizontalization) to clusters of statements that reflect themes or constructs, then to structural, or patterned, descriptions of the experience. These structural descriptions are then used to portray a common "essence" or composite description of the experience. The coherence process was recorded in the iteratively created databases and code books for this project and is reported in the results section.

Thematic saturation. Thematic saturation was developed in the context of Grounded Theory, which is a type of qualitative research that is done to inductively develop a theory about a specific idea (Ando, Cousins, & Young, 2014; Creswell, 2013). This dissertation project is an exploratory sequential design instrument development study which uses mixed-methods, primarily phenomenological, and was designed to explore the physical activity-related experiences of individuals. The aims of the phenomenological section of this study were broad and exploratory, and included participants with very different behavioral, cognitive, and emotional patterns. While thematic saturation was a goal, especially for the "new" sudden gain construct, because this is an exploratory phenomenological study, a theme of repetitiveness across interviews was considered sufficient evidence that the construct should be represented in at least the initial item pool. However, in instances where thematic saturation occurred, it

served as further indication that the reported patterns may generalize to a larger population.

For the purposes of this study, thematic saturation was considered to occur under these circumstances, as per Francis et al., (2010): 1) an initial participant's responses suggest a fit with a pattern or construct of interest, 2) followed by a report of a similar pattern of interest by the next three participants who are similar as regards exercise history and exercise preference, and 3) no new relevant data are added by subsequent interviewees who are similar to the first four.

Since the concept of sudden gain is of particular interest to this investigator, and thematic saturation did occur for this theme, here is an example of thematic saturation as found for sudden gain: 1) an initial participant who is an intermittent exerciser, with little or no childhood or adult history of regular formal exercise, shows a sudden gain pattern, 2) at least the next three participants who are have similar histories, and are intermittent exercisers (the sedentary category is considered an intermittent exercise pattern, since even those who are primarily sedentary get some physical activity) also report sudden gain, and 3) no subsequent participants report significantly new data as regards sudden gain. Further, and perhaps more germane to the topic of this study, four participants who report the "sudden gain" pattern would be considered adequate evidence that that the construct is viable, and that items designed to assess the construct "sudden gain" can usefully be included in the initial item pool for the measure being developed. Other themes that reached saturation were amotivation, high levels of sedentary behavior among students (though this may be considered "finding" rather than a theme that meets

saturation), and social support variation. Several themes approached thematic saturation, including automaticity, habit, and "overdoing," which is a construct that was derived from the interviews, and is described in the Results section below. Also, although it is not considered a theme because it is specific to students, there was a very consistent "semester effect" in that almost all of the interviewees reported that the stress and lack of time during midterms and final weeks of the semester had an effect on the frequency, duration, and intensity of their exercise behavior.

Step 2: Generation of Initial Item Pool

The purpose of Step 2 involved the development of an initial pool of items designed to assess the self-regulatory constructs of interest as found in the literature and in the qualitative data. This was done by the principal investigator and the *research group*, which consisted of undergraduate research assistants who were trained by the principal investigator. The research group extracted themes from qualitative interview data, coded for observed patterns and constructs, and was instrumental in the development and refinement of items designed to assess the constructs derived from the literature and qualitative data. In the course of thematic analyses, development of the manuals and resolution of disagreements was done by consensus of the research group, with final decisions made by the principal investigator. The coded qualitative data were used by the principal investigator and the research group to write and refine a set of 92 items which were used in the Layperson's Refinement Survey (see Appendix F for the Research Group Refinement Instructions Handout, and the initial 92 item pool).

Step 3: Online Layperson's Refinement Survey

After the initial item pool was created by the principal investigator and the research group, the items were used to create a layperson's refinement survey, titled the "Online Layperson's Refinement Survey," the purpose of which was to provide laypersons' feedback on the understandability and clarity of the initial item pool.

Lay participants. Participants were recruited from the University of Hawaii student body by the SONA System, which gives students extra credit for participation (see Appendix G for SONA System recruitment notice for the Layperson's Refinement Survey, plus email notices in case they were needed). Thirty two-part surveys were completed; 5 respondents filled out both Part A and B, and 50 respondents filled out either Part A or Part B. Participant age range was from 17- 44 years old, with a mean age of 19.4 years old. Participant ethnicity was diverse, with 40.3% of participants reporting being of mixed ethnicity, primarily Asian and Polynesian/Hawaiian. There were 19.2% Caucasian, 7.7% Chinese, 9.7% Filipino, 7.7% Korean, and 15.3% Other. The participants in the refinement survey were 32.7% male, and 67.3% female.

Procedure and materials. As per Nardi, 2006, the purpose of this online study was to help further refine items by rating the clarity of the wording of the items and instructions. A brief explanation of the purpose of the proposed questionnaire, and the items themselves, were presented to the lay participants. Participants were asked to first answer each item as they normally would. Each item was followed by three refinement questions: a) the clarity rating item, b) the relevance rating item, and c) a comment box. The participants were asked to give clarity ratings for each item ("Please rate the clarity

of question 1 – how understandable is it?") on a 5-point Likert scale with the following options (1) = The question is very unclear, (2) = The question is somewhat unclear, (3) = The question is clear, (4) = The question is very clear, and (5) = The question is extremely clear. Participants were then asked to assess the relevance of each item ("Please rate the relevance of question 1 to self-control as applied to exercise or physical activity – how related to exercise or physical activity is the question?") using the following options (1) = The question is not at all relevant, (2) = The question is somewhat relevant, (3) = The question is moderately relevant, (4) = The question is very relevant, and (5) = The question is extremely relevant. Last, for each question, a comment box was provided, so that participants could comment on their own experiences, or on potentially biased or problematic wording, as well as grammatical, formatting, and other problems (please see Appendix H for the print example of the Layperson's Refinement Survey).

Step 4: Second Refinement of the Item Pool and Creation of a Sudden Gain Screener

The data from the Layperson's Refinement Survey was used to further refine the full item pool for the Amotivation to Automaticity Questionnaire. Additionally, the principal investigator and the research group decided to create a sudden gain screener for the recruitment of future interviewees that fit criteria that suggest that they might be more likely to have manifested a sudden gain pattern. The research group felt that a screener specific to sedentary participants was needed because it was difficult to recruit sedentary and/or overweight participants for the principal investigator's prior two studies.

Amotivation to automaticity initial item pool. The item pool was further refined per the suggestions contained in the layperson's refinement survey, as interpreted by this investigator and the research group. Any item that had an average clarity rating below three was reviewed and amended according to the layperson's suggestions and research group consensus. If the research group decided the item was irreparable or unnecessary, it was dropped from the refined version of the item pool.

Sudden gain screener item pool. The items that are designed to assess sudden gain were used to create a stand-alone research recruitment screener for people who are likely to report a sudden gain pattern (see Appendix I for the initial version of the Sudden Gain Screener). The items in this screener were refined using the same method noted above for the Initial Item Pool.

Results

Qualitative Interviews

The first phase of this instrument development project was the collection of in-depth qualitative data that explored self-regulatory and emotional factors that may influence sedentary and physical activity behaviors. From 29 transcribed interviews, 456 significant statements were extracted. Sixty-four clusters of meaning were derived from those statements (see Appendix J for the list of meaning clusters). The clusters of meaning were then coalesced into 10 themes, which are described below.

Thematicize Data And Create Initial Item Pool

After the interviews were transcribed and de-identified, the research group began the extraction and/or refinement of themes or constructs related to physical activity behaviors. Themes from the qualitative data were used in conjunction with relevant literature to drive the creation and refinement of an initial pool of items designed to assess the self-regulatory and emotional factors that may influence sedentary and physical activity behaviors.

Brief definitions of each theme follow and are illustrated using both qualitative and quantitative data. Tabular data for each theme includes associated subconstructs, and fitness data for the purpose of situating the sample and contributing to information that may be used to support triangulation. Narrative descriptions of each theme follow the tabular data, including representative statements. To further situate the sample and provide more triangulation evidence, a brief description of each participant who made the representative statement is provided. To emphasize the personal and individual nature of the data, and because one participant can make several separate statements that are good illustrations of different themes, each participant is given a pseudonym which will always be presented in quotes. Please see Appendix K for a list of participants with short demographic entries and, if applicable, the pseudonym used when significant statements were presented.

Theme 1: Physical activity variation. Physical Activity Variation is addressed first because it is the primary "independent variable" by which participants' self-regulatory cognitions, emotions, and behaviors are categorized. Categorizing participants

by exercise amount (those who do/do not meet federal minimum recommended amounts of exercise/physical activity) was done first because it is the categorization with the most empirical backing. After examination of the wide variability in patterns of exercise in our sample we chose to further categorize participants by physical activity preference. As a reminder, formal exercise refers to physical activities that are done specifically for the purpose of improving fitness or physical performance, whereas informal refers to physical activities such as hiking, and also to functional physical activities such as digging in the garden. Last, we coded by whether the interviewee' primary source of physical activity was work-related and/or functional exercise. Table 3 "Physical Activity Variation" contains subconstructs that were used to categorize exercise behavior, followed by triangulation data.

Table 3.

Physical Activity Variation

Amount Physical Activity	Triangulation Data							
Subconstructs	n	Average Daily Hours Physical Activity	Average Daily Hours Sedentary	Average BMI	Average % Body Fat	Average Age	Preferred Type of Physical Activity	Gender
Meets FMR	11	3.9	6.4	Meets-FMR: 24.2 Body Builder: 22.3*	Meets-FMR: 20.6 Body Builder: 19.3*	22.6	82% Formal, 9% Functional, 9% All	45% M, 55% F
Near FMR	7	3.9	7.0	23.5	26.3	20.2	29% Formal, 71% Informal &/or Work	43% M, 57% F
Does-not-meet-FMR	11	1.3	7.6	27.0	Does-not-meet-FMR w/Sedentary: 30.1 Without Sedentary: 26.1	23.6	18% Formal, 54% Informal, 27% Work Primary	9% M, 91% F

Sedentary Behavior	3	0.73	8.3	32.2	40.7	32.3	100% Informal	100% F
Formal exercise preferred	15	2.7	6.8	23.6	18.4	20.6	N/A	53% M, 47% F
Informal physical activity preferred	14	3.2	7.4	26.7	28.8	24.8	N/A	100% F
Work-related physical activity is primary source of physical activity	6	3.1	7.4	25.9	28.7	21.2	N/A	17% M, 83% F

** Three body builders had artificially high BMI because high amounts of muscle mass disproportionately increased their weight.*

As can be seen in Table 3., there is good triangulation between the multiple sources of information regarding fitness for each group. Representative statements of participants about the "Physical activity variation" theme follow.

Representative statements from a formal, habitual, strongly self-regulated exerciser:

"John" is a 21-year-old Caucasian male who reported having been an avid exerciser since early childhood. He often sailed, hiked, or biked with his father. He was also on the University Student Athlete Roster. He is classified as an "avid" exerciser, rather than simply as an "athlete" because he voluntarily does physical activities outside of those required for his sport involvement.

> "I have strength conditioning practice twice a week, which is weights in the weight room, weights and cardio. Um, it's like usually an hour, hour and a half. Then, we have sailing practice usually about three hours on the water."

> "And then I, something that I do outside of what I'm required for the team… I road bike. That's something that I've done long before high school and during high school and stuff, and I bought a bike out here, and I probably ride 90 to 150 miles a week."

Representative statements are quoted below from a participant who prefers informal exercise, and although she gets regular physical activity, the overall amount and type of physical activity place her below the Federal minimum recommendation:

“Anna” is a 36-year-old Caucasian woman who was moderately active during her childhood, but who did not exercise with her family members. She did not participate in school sports but did report doing 5 days a week of practicing outdoors with the marching band throughout high school. Her patterns of physical activity behavior are highly variable, but she typically tries to do some physical activity each week.

> “Ok, so I’ve restarted bike riding. So, I did that today to get here… I try to do it 5 days a week. It’s more like 3 days a week - I won’t do it when it’s raining…”

> “And there's that, like, beach - we ran around that park, whatever it's called, and then we swim… We've been pretty lazy about it this semester… and I haven't... I always give up on the running and then walk while they run...”
>
> “Supposed to be every weekend, yeah…” [but is probably] Every third weekend.”

Representative statements from a participant for whom work-related physical activity is the primary source of physical activity/exercise:

“Maria” is an 18-year-old Hispanic woman who was active in a variety of school sports throughout her childhood and during high school. She went to an all-girls high school, at which there was reportedly a strong cultural pressure to eat right, exercise, and have a perfect body. She stated that she now actively avoids becoming obsessive about working out and body image; she reported that she decided that she did not want to become “the

kind of gym person that I didn't like." She also stated that she still likes team sports, but only when playing in low-pressure, non-competitive games. Her primary and most regularly scheduled physical activity occurs in her employment setting.

> "… I've been working more because I've been training, because I just got the job. It's, like, for a photo booth company… I'm setting up the [booth] - I have to set up everything up, move boxes, and that kind of thing."

> "Yeah, yeah, I definitely, like, break a sweat and you have to, like, make the entire photo booth from scratch, yeah. You have to, like, break it down [after], so yeah, you have to do all that kind of stuff."

Representative statements from a participant for whom the primary source of physical activity is functional; derived from normal activities of her daily life:

"Lydia" is a 40-year-old Japanese/Caucasian mother and housewife who stated that due to having returned to school, she has stopped formal exercise and now does only functional exercise:

> "I just try to make my daily life more of an exercise… when I'm doing laundry, I don't take it all out of the dryer, I'll just bend down and get one thing at a time... So, maybe like, 30 little mini air squats while I'm doing laundry, and then I'm like, 'Okay, I'm done… that's enough for today.'"

"…so, I do go up and down the stairs a lot. And I have a dog, so I walk my dog, maybe - they're short walks - but at least three times a day. So, maybe 15 minutes."

"I'm a lot more conscious of my posture now as far as doing things — like pots and pans, and backpacks, things that are heavy. I try to use the right muscles and not just grab it, but straighten my back first…"

Theme 2: Amotivation. Amotivation refers to lack of self-determination (Deci & Ryan, 1985; Markland & Tobin, 2004). It has two primary defining facets, 1) a desire or intent to manifest and maintain a target behavior, in this case habitual physical activity, and 2) unsuccessful attempts to initiate and/or maintain routine physical activity. Although a physical activity routine may be started, it is not maintained, nor is it replaced with other equivalent physical activity. Amotivation is different from simple lack of exercise in that an acceptance or understanding that exercise is needed must be present. Thus, "Julia" who states that she feels that she needs to jog regularly to improve her health and performance, is amotivated regarding jogging because she reports several stop-and-start attempts to maintain a jogging habit (see below). In contrast, "Lydia" the functional exerciser introduced above, states "…I avoid cardio completely. I hate it, so much." "Lydia" is not considered to be amotivated because she does not feel intent or need to do any type of cardiovascular physical activity.

Although amotivation is typically considered to be an issue primarily for non-exercisers, one a priori assumption used in the design of this study was that habitual exercisers

would report amotivation for certain less-enjoyed types of exercise. This assumption was supported; we have found evidence of amotivation in both exercisers and non-exercisers, although none of our participants who showed a pattern of amotivation preferred formal exercise. However, as can be seen from the differences in average daily physical activity and BMI in Table 4, they are distinct groups.

Table 4.

Amotivation

	Triangulation Data							
Type of Amotivation	n	Average Daily Hours Physical Activity	Average Daily Hours Sedentary	Average BMI	Average % Body Fat	Average Age	Preferred Type	Gender
Amotivation for habitual physical activity (overall)	5	1.4	7.5	33.1	43.5	28.8	100% Informal unless in sudden gain period	100% F
Amotivation for specific physical activity although regular exerciser	5	3.0	7.1	21.5	24.4	21.5	100% Informal unless in sudden gain period	100% F

Participants who are amotivated for physical activity overall spend less time being physically active, have an average BMI that is in the “Obese” range, and are older than those who are generally active but cite amotivation for specific forms of exercise. The average BMI for the specific amotivation is in the “Normal” range (Centers for Disease Control and Prevention, 2017). It is also interesting that there are high levels of sedentary behavior in both groups. As will be discussed in the section on sedentary behavior below, all of our participants reported higher than optimal sedentary behavior, reportedly because students have to do so much siting for classes and homework.

Representative statements from participants with overall amotivation for physical activity:

“Gabriela,” is a 21-year-old Filipino woman whose Body Mass Index of 43.2 places her in the “obese” category. “Gabriela” reported that she was not active for most of her childhood until she spent 3 years taking martial arts classes in high school. She intensely enjoyed them and spent a lot of time practicing. She stopped going to them her senior year so that she could concentrate on academics and has never habitually exercised since. Gabriela’s representative statements show how amotivation can feel for a non-exerciser:

> "I think about wanting to work out, but it never happens. I’m like, ‘Oh, I think it should be a good idea…’ [and then] I’m just like, ‘No... not really.’”
>
> “I did try last year…to try to go to the gym, even if I first started once a week, and I would have my friends come with me and support me, and I

got really tired of it, because it was so boring, I couldn't stand… I was, like, 'This is not it for me. I can't be doing this.'"

"Blaine" is a 29-year-old Caucasian female whose BMI places her at the borderline of underweight and normal weight. She reported that she was regularly physically active as a child or with her family, although she occasionally went to 1-2 week summer camps for sports like tennis or soccer. She would like to improve her general tone and cardiovascular endurance:

"Yeah, I think … there's been a couple stop and start efforts. Since [steady boyfriend] left for [new job], I have probably tried exercising on maybe three or four occasions [in a period of 3 months]. I got some weights... every time, I put it back down."

"I don't think I've ever gotten excited about the exercising part. I've gotten excited about the idea of the lifestyle and of being more fit in the long run. Yeah, I'd say there are variations in motivation, because I do need to get motivated to do… I don't tend to trust those bursts of motivation and I've been right not to so far, because I know that it fades."

"Taylor" is a 28-year-old female; her patterns of physical activity come the closest to a lay person's definition of a sedentary person. She did not exercise or do much physical activity as a child or through high school, and intermittently did formal exercise in her undergraduate college gym, and when working after she finished her bachelor's degree. Taylor's BMI of 34.6 places her in the "obese" category. She is in a committed

relationship with a partner who is also primarily sedentary. They have supported each other in starting exercise routines, but they typically also support each other when they begin to find exercise aversive as well. She made several statements indicative of amotivation in the context of physical activity:

> “It’s always been difficult for me to tell myself to do things, if that makes sense, and hold myself accountable for things that I’m doing. “
>
> "Me telling myself, 'Okay, now, this is something you do,” - and me then saying to myself, “No, I’m not, I’m not going to do it.'"

Representative statements from participants who exercise regularly but have amotivation for a specific disliked physical activity:

“Julia” is a 29-year-old Caucasian woman who did very little regular exercise/physical activity during her childhood. She currently habitually does several forms of physical activity, and loves all physical activities connected with being on or near the ocean such as swimming, paddling, surfing, snorkeling, etc. “Julia” provides representative statements for amotivation with reference to starting a jogging habit:

> "Yeah, jogging is one of those - I don’t actually like it, but it’s one of the things I feel like I should do. "
>
> "I never keep doing it. I do it for a week or two, and then I fall off, and then I come back. I’d say I spend…I have one motivated jogging week a

month." "You know what I'm saying? I keep trying to make it a routine and I just can't get to."

Theme 3: Automaticity. A behavior, or the decision to behave, is considered "automatized" when it is frequently or habitually occurring, is done with little or no conscious control, awareness, or intent, and thus it involves very low self-regulatory effort (Orbell & Verplanken, 2010). As noted in the introduction, automaticity is associated with improved performance and lower chances of lapse of the habit (Gardner, 2012; Rhodes, Fiala, & Nastui, 2012). Automaticity, in the physical activity literature, typically refers to the automaticity of making the decision to exercise, rather than the automaticity of the exercise behavior itself, although people who have a long history of physical activity at a regularly scheduled time may also report that they automatically get up and do the activity. Automaticity in the exercise/physical activity literature has generally been considered the purview of the strongly habitual exercisers, but in our exploration of the sudden gain construct, we have found that when someone who is not normally an exerciser is in a period of sudden gain, they may report both subjective and objective conditions of automaticity, but only temporarily. As soon as the sudden gain period ends, the behavioral and cognitive/emotional characteristics of automaticity end. This form of what is called "temporary automaticity" for the purposes of this study, will be discussed in more detail as part of the sudden gain construct below. In Table 5 temporary automaticity will be included so that triangulation data for that group can be compared to those who apparently have developed automaticity for exercise and physical activity, as well to those who do not evince automaticity.

Table 5.

Automaticity

	Triangulation Data							
Group	n	Average Daily Hours Physical Activity	Average Hours Daily Sedentary	Average BMI	Average % Body Fat	Average Age	Type Exercise	Gender
Evidence of automaticity present in habitual exercise/physical activity behavior	7	3.1	7.1	23.6	17.4	21.1	86% Formal, 14% Informal	60% M, 40% F
No evidence of automaticity in exercise/physical activity behavior	19	3.2	6.7	24.0	23.2	21.5	5% Functional, 21% Informal, 32% Work, 42% Formal	26% M, 74% F
Evidence of "temporary automaticity" when in a sudden gain period	3	0.8	8.4	34.6	45.6	31.3	100% Informal	100% F

Another interesting finding from our qualitative data was that participants often spontaneously described automaticity in terms of somatic effects, e.g., feeling "antsy," sluggish, "gross," or "bloated" if they missed too much of their routine physical activity. The representative statements below portray this feeling and others associated with automaticity in decision-making and behavior.

"Alani" is a 19-year-old Hawaiian woman who enjoys both formal and informal physical activity. She has a childhood history of sports and informal physical activity involvement, including frequent exercising with her parents. She regularly meets or exceeds the Federal minimum recommended amounts of formal physical activity, as well as going hiking, swimming, or fishing on the weekends. She also reported that her employment requires that she stand and/or walk most of her shifts.

> "I've just been doing it for so long, so I automatically just crave to increase my heart rate. It's good."

> "It [exercise] helps me feel pretty good. If I don't work out, I feel like a slug. If I do work out, I feel healthy, wake up in the morning energized kind of feeling. If I don't, I'll wake up and feel groggy. I don't know why. Just a routine I guess."

"John" the avid formal exerciser and athlete who was introduced above, made the following statement, which is suggestive of automaticity, when asked if there was much variation in his motivation to exercise:

"Not really. It's just something that has become a part of what I do, and it's what I enjoy to do… that doesn't really fluctuate much."

“Tane” is a 20-year-old male who describes his ethnicity as mixed Asian/Polynesian. He is a pre-med major and hopes to enter a body building competition in the near future. He has a history of childhood involvement in sports and informal exercise in and out of school; he reported running half-marathons with his parents while he was in high school, although his preference is for weight-lifting with his friends, which he has been doing since middle school. The following quote from him illustrated the lack of conscious effort that is one of the characteristics of automaticity in exercise:

"…actually on Saturdays I usually wake up and go do cardio…it's just like a repetitive thing that I've done… I'm not even thinking for some reason. Yeah, I guess that's the only time where I'm not thinking ‘Ugh, cardio.’”

Theme 4: Effects of emotions on physical activity behaviors. One large set of significant statements centers around the effects of emotions on the manifestation of physical activity. The type, duration, intensity and frequency of physical activity are all subject to variation due to emotion-related events in participants’ lives. Table 6 shows the frequency of interviewee’s coded endorsement of emotional effects on physical activity behavior.

Table 6.

Frequency of Reported Emotional Effects on Physical Activity

Meaning Cluster	Frequency	%
Favorite Leisure activity is sedentary	20	69.0%
Emotional effects lead participant to vary physical activity to the point that the participant may not exercise, or may cease to maintain habitual federal minimum recommendations	16	55.2%
Emotion vs. Logic: Emotion-driven day to day physical activity decisions	14	48.3%
Exercise type preferences affect amount and/or type of exercise	14	48.3%
Stress: Does this participant exercise to reduce stress/feel stressed if they don't exercise/feel stressed if they are supposed to exercise but don't want to/	12	41.4%
Participant reports allowing boredom with exercise or type of exercise stop or reduce exercise	10	34.5%
Does participant report a history of being overweight or otherwise unfit in childhood? Count includes reportedly "skinny kid" who became a body builder.	9	31.0%
Romantic situation changes create changes in exercise/physical activity behavior	9	31.0%
Emotion vs Logic : Logic-driven physical activity decisions day-to-day	8	27.6%

Participant's has considerable concern with body image/negative social comparison	8	27.6%
Diet/eating issues, especially as a substitute for exercise, when restricts because desires to maintain body shape, and/or dangerous supplement use (These were spontaneous - no questions re: diet were in the interview)	8	27.6%
Spontaneous physical activity is easier than planned	8	27.6%
Guilt: for not exercising/ not exercising enough/etc.	8	27.6%
Emotion vs. Logic: What drives decisions fluctuates, or includes approximately equal amounts of both	7	24.1%
Sports/Exercise are a major aspect of life	6	20.7%
Resentment/defensiveness when expected to exercise	5	17.2%
Sweat; likes or dislikes sweating	4	13.8%
Avid exerciser (formal or informal)	4	13.8%
Participant's primary concern with physical activity is bigger muscles	3	10.3%

The richness and variation of the interview information about emotion and its effect on physical activity behavior made it difficult to condense the information without losing meaningful data. The initial assumption was that non-exercisers would have primarily emotionally-driven physical activity behavior, whereas habitual exercisers would be primarily logic-driven, at least with reference to how they maintained their exercise routines. This assumption was borne out to a degree, but the advantage of exploratory qualitative data is that it may demonstrate the unexpected. We found that variables that tended to affect non-exercisers (for example, dislike of exercise) also affected exercisers. While participants who were having difficulty with initiation and/or maintenance of routine exercise reported that dislike of exercise was a large part of their inability to maintain the habit, a subset of habitual exercisers reported they liked either cardiovascular exercise, or weight lifting, but not both. Often, they would not do the disliked exercise, or would do only the minimal recommended amount of it.

Further, factors that caused a sharp reduction in exercise for some – for example, the breakup of a romance – might create a sharp increase for others. Interestingly and understandably, the break-up of a romance was occasionally reported to have both decreased and increased exercise behavior at different periods in the participant's processing of the of the break-up. Additionally, the beginning of a romance could create similar effects, as could simply becoming romantically interested in someone, although admittedly becoming romantically interested in someone typically increases physical activity – there were no reports of it reducing physical activity in this sample.

Perhaps the most interesting finding about emotionality in physical activity behavior was that *all* of our participants, even those who reported logical reasons for exercise and high levels of self-regulation, reported pervasive emotionality related to their physical activity behaviors. Many apparently highly self-regulated exercisers had clearly emotionally-driven reasons to *start* exercising, although their emotionality seemed to have very little day-to-day effect on their maintenance of routine physical activity.

To approach coalescence of these data, we first categorized participants as being primarily driven by either emotion, or by logic in their day to day decisions about physical activity. Whether they allowed day-to-day emotional fluctuations to sharply change the amount or intensity of their physical activity was taken into consideration in this coding decision as were reports of stopping and starting exercise and/or physical activity due to mood, romantic changes, stress, and refusal to do the federal minimum recommended amounts of disliked exercises. Factors that were not addressed in making coding decisions about emotionality included time constraints, injury, and variations in social support for physical activity (which is addressed separately below). However, if a participant reported allowing fear of negative social comparison or interpersonal loss to restrict physical activity, it was considered an emotional effect. After much discussion about one subset of participants, the research team realized that there were people who do not fit readily into either primarily "Emotional" or the primarily "Logical" groups, so we created a category for participants whose emotions affected their physical activity habits, but to a more moderate degree and called it the "Both" group. These data are presented in Table 7.

Table 7.

Emotional Effects on Physical Activity Behavior

	Triangulation Data							
Group	n	Average Daily Hours Physical Activity	Average Daily Hours Sedentary	Average BMI	Average % Body Fat	Average Age	Preferred Type	Gender
Emotion vs Logic: Logic-driven day to day physical activity decisions	8	3.1	6.9	Meets-FMR: 24.6 Body Builder: 22.3*	19.8	20.0	10% Informal, 90% Formal	70% M, 30% F
Emotion vs Logic: Approximately even influence on day to day physical activity decisions	7	3.1	6.5	22.3	16.5	22.1	10% Informal, 10% Functional 80% Formal	40% M, 60% F

Emotion vs. Logic: Emotion-driven day to day physical activity decisions	14	2.7	7.3	26.3	30.4	23.5	10% Formal, 40% Work, 50% Informal 10% Functional	10% M, 90% F
Emotional effects lead participant to sharply vary physical activity		2.7	7.2	25.8	28.0	23.9	10% Formal, 30% Work, 50% Informal	20% M, 80% F

** Average calculated with and without 3 body builder's BMI*

Overall, the “logic” group reported very little variation in exercise behavior for any reason except injury and reported consciously using logic-based means to maintain their routine, such self-control, cognitive and behavioral strategies, and meticulous scheduling of sleep, food and water intake, and activities such as school, work, and homework, so that they could maintain their physical activity routines. In contrast, the emotional group reported frequent variation in physical activity behavior due to dislike of exercise/physical activities, changes in romantic situation, becoming bored with specific activities, feeling negatively judged in gyms or exercise classes, disliking the amount of time and effort required to plan for exercise, dislike of perceived impingement on leisure time, and several other emotion-based reasons for their behavioral choices.

There were hundreds of representative statements regarding the effect of emotion on physical activity. The following selection illustrates some of the variety in emotions surrounding exercise. Some of the statements are quite straightforward:

“John,” the avid athlete, has emotional affects that are typically positive: “…sailing’s a passion and I really, really enjoy bike riding,” whereas “Blaine,” who was introduced above in the Amotivation section, when asked what her feelings toward exercise are like on the days that she does not maintain her intended routine, stated: "All I can think about is, 'Oh my god. That sounds so miserable.'"

Other significant statements are not quite so straightforward, but do reveal a variety of emotional reactions:

“Robert,” an 18-year-old Filipino man who was regularly involved in swimming and tennis through high school, made the following statement about the only time he felt he was especially motivated and happy to exercise. This statement also illustrates an interaction between motivation (emotional) and ability:

> “I think, I know in my junior year, I beat a pretty good guy on a [tennis] team. And I was surprised that I beat him. So I felt that I was doing better, yeah.”
>
> “Well, I felt like I was doing really well in comparison with other people on the team, and that I could actually do better than my peers, so felt that I should take advantage of the motivation and ride it and see how far it would go. Mm-hmm.”

“Janice” a 40-year-old woman who has her own business and is considering applying to graduate school. She reported that she had little or no regular exercise in her childhood, and no sports involvement. When asked whether the family did any sort of physical activities together she stated “No, they were not exercisers. Smokers, drinkers, and eaters.” Janice’s BMI places her in the “obese” category (Centers for Disease Control and Prevention, 2017). Janice reported several emotional effects that have influenced her to both increase and decrease exercise behavior:

> “Yesterday, I didn't come to school and laid at home and slept, because I was depressed about a boy.”

> [Today] “I parked on the bottom of the parking structure and walked up five flights of stairs... and I walked up the three to get up here, and then I walked up to get lunch. I popped it [amount of informal exercise] up a bit today... because yesterday I decided that fat girls don't get love."

Here “Janice” illustrates a common problem for those who have a pattern of stopping and starting exercise. They feel guilty when they don’t – and guilty when they do:

> "After [an exercise session] I feel like I haven't done good enough, I didn't sweat enough. I still have guilt after, even though - but I also feel like I did accomplish something. I do a lot of ‘beat myself up.’"

“Janice” also reported several forms of fear of negative social comparison. The following quotes were in reference to having taken an aerobics class:

> “I was annoyed that I took it. Because it was - I didn't feel like I was the same as everyone. I feel like an outsider - can't keep up, can't, you know, you're the one sweating the most. That's - so yeah, nervousness, but also, I mean, I do get - once I do it, I get the endorphins and I get excitement and the pride of having done it, so I know that's to come, but it's just really hard to get myself to do it because of all the uncomfortableness that goes around it.”

> “… embarrassment because… the clothes you have to wear to the gym are very revealing… do I wear the clothes that the thin girls wear? Do I wear baggy clothes? Do I act like I'm all - you know - fat-tastic?"

> “I just feel judged, which is - I'm probably the only person there judging me..."

“Janice” is also one of the five participants who reported that the need to add regular physical activity to her schedule felt like an impingement on her leisure time:

> "Yeah, there's that. And there's 'I'm going to eat what I want’ … But yeah, it's kind of an entitlement of: this is my space and my time and if I'm just - I just don't want to. I just want to veg out."

“Hana” is a 20-year-old Japanese/Chinese woman who reported having been physically active all of her life until the previous semester, during which she became sedentary due to depression after a break-up with her steady boyfriend. However, at some point during the winter semester break, she began to use exercise to help in her recovery:

> "Well, after I broke up with my boyfriend, about seven months ago, I went into like, a deep depression. And kind of like, just sit around and cry all the time. Like not want to eat anything, but then I started like, losing track of myself. So, I started like, running, and then I went to the gym ... And, yeah. It kind of worked for me, a bit."

“Jia” is a 19-year-old Chinese woman who reported that she did not do sports in school, or exercise with her parents during childhood. She prefers a combination of formal and informal exercise but has not been able to use self-regulation to maintain habitual physical activity for more than a few weeks at a time. She has tried the gym with and without friends and is currently using an app (once a

week) for activity tracking and workout suggestions. In the following quotes she describes reasons for her loss of motivation:

> "Then, for the past few weeks, I was really set on exercising, at this one day, and then on that day I didn't exercise. So then, the next time… Yeah, so my schedule was - I go jogging every Wednesday and then Sunday. So, it's like a gap... Yeah, but then after I was, "Oh, I don't want to do it on Wednesday anymore, and then Sunday came around and I didn't do it either, yeah… I think it was just my mood, probably."

> ["Jia" was asked whether her new app increased her motivation to exercise] "A little bit because it was really new. I wanted to see all the exercises that they had, but then once I saw all the exercises, and there wasn't anything new, then I stopped it a little bit."

"Anna," introduced above as an intermittent, informal exerciser, being honest about her favorite leisure time activity: "My leisure time, I like to go drinking a lot."

"Jana" a 21-year-old Filipino woman had just transferred to this university, became stressed by financial troubles, had to get a job in mid-semester, when she was already adjusting to her move, her new school, and was extremely stressed about her grades. She was asked how long she had felt stressed before she went for a jog, rather than watching TV to reduce stress:

> "I feel them [stressors] for long periods of time. I think it's most often, when I can't handle--or when I'm stressed at my job, and at the same time, it's not helping my grades because I'm stressed with my job. "
>
> "…there was too many things coming up a lot. So I just went on a run."
>
> "Yeah, I didn't know how to distribute my negative energy."

"Anna" describes a similar pattern:

> "Some - every once in a while, but when like super stressed and anxious, I will go running, and I won't run for a very long, but that sort of calms me down. But, [the stress] has to be real bad… Really, really bad."

"Anna" and "Jana" both reveal the interactions between stress and time constraints on emotionality. Two participants who typically prefer to do informal and intermittent physical activity both stated that normal amounts of stress during the busy periods of the semester make them want to go home and relax using sedentary leisure pursuits such as Netflix and social media. However, both also reported that there had been a few times when they experienced peak periods of stress during the semester, when they had to be at work, at school, and spending most of their time preparing for tests, projects, and other rapidly approaching deadlines. Both reported that at some point they felt overwhelmed and unable to handle the stress and anxiety they were experiencing, and that they suddenly felt an intense need to run to reduce the stress. Both participants noted that they actually disliked running. In both cases, they ran that one time and then did not do it again until the next period of peak stress.

Theme 5: Habit. Reviews of studies that assess the effect of a history of childhood physical activity have reported differing outcomes, likely due to differences in whether the child felt forced to engage in physical activities and sports, or whether the child did so out of interest (Sherwood & Jeffery, 2000). Parental engagement in physical activity with the children, which is different from parents simply encouraging or "forcing" physical activity, is also an important factor (Moore et al., 1991). Our data seem to support the importance of childhood habitual exercise (including parental involvement). It is of interest that both of the students in our sample who are on the University of Hawaii student athlete roster reported not only practicing their sport from an early age, and engaging physical activity with their parents, but also the active involvement of their parents in supporting their children's sports-related activities by practicing with them, providing transportation, and other sport-related support activities throughout childhood. Further, as can be seen in Table 8 below, there is a notable difference between average sedentary hours between the group with a strong childhood history of exercise (daily average = 6.2), and the group without (daily average = 8.0).

Interviewees were asked whether they had done physical activities, exercise, or sports as a child. They were also asked specifically about whether they exercised with their parents. Participants whose replies suggested a clear categorization as having either a history or no history of physical activity are presented in Table 8 below for comparison.

Table 8.

Childhood History of Exercise/Physical Activity

		Triangulation Data							
Group	n	Average Daily Hours Physical Activity	Average Daily Hours Sedentary	Average BMI	Average % Body Fat	Average Age	Preferred Type	Gender	Emotional Logical
History of habitual childhood physical activity	14	3.3	6.2	22.1	19.3	19.6	0.7	0.4	40% Logical, 40% Both, 20% Emotional
No history of habitual childhood physical activity	7	2.0	8.0	29.5	26.1	36.1	0.7	100% F	100% Emo

** Average calculated with and without 3 body builder's BMI*

There was also a set of people who could not accurately be placed in the history/no history categories, and so were assigned to a "Both" category, a breakdown of which is shown below in Table 9. These were participants who, for example, reported doing 1 or 2 years of physical activity or sports in their whole childhood, rather than having engaged in regular physical activity throughout their childhood. One good example of this type of participant is "Bill." He is a 29-year-old veteran who reports being "mixed race." He reported that he did not do regular sports or exercise in his elementary or middle school years. He did report that he was always "super-skinny," which led him to one brief bout of regular bicep curls "with my Dad's weights" when he was 11. He later played basketball for two years in high school and reported that he and his parents went together to a gym for one summer, so he could get in shape to play high school basketball: "I think it was at that time, we all kind of wanted to get into it." He did not systematically exercise again until he joined the Army at age 21. He remained enlisted for four years, and he began body-building then. He has been in one formal body-building competition and intends to compete again. "Bill" currently does weight-lifting five or more days a week and cardiovascular two days a week, and he regularly exceeds the Federal minimum recommendations for physical activity. Interestingly, "Bill" is also mentioned in both the "Obligatory/Overdoing" and "Sedentary behaviors" sections below.

Another participant in the 'Both" category reported a different intermittent pattern. "Donna" is a 22-year-old Japanese-Caucasian woman who stated that she does not really like exercise. She gets most of her current physical activity from spending one hour twice a week delivering intra-campus mail. When "Donna" was asked about childhood physical

activity she reported that she did one year of youth league soccer when in middle school, and one year of gymnastics in high school. Regarding exercise with her parents she reported that during the school year her family might hike or go to the beach one time a month, but their pattern in the summer was different:

> "In the summer maybe like, twice a month, or like, do maybe one hike and then go to the beach a couple times a month… My parents would take us on more hikes [then] because when we were young, we didn't have much responsibility and homework… Sometimes my dad would take us to the gym, but not too often."

Table 9 shows how strong the effect of childhood habitual physical activity is to the development of adult physical activity, at least in our set of interviewees. The differences in the BMI and percent body fat in the two top and two bottom rows of Table 9 suggest a clear effect of lifetime habit of exercise.

Table 9.

Habit: History of Exercise/Physical Activity in Childhood and Adulthood

Physical activity history:	n	Average Daily Hours Physical Activity	Average Daily Hours Sedentary	Average BMI	Average % Body Fat	Average Age	Preferred Type	Gender	Emotional Logical
Regular physical activity in both childhood and adulthood	12	3.6	6.2	22.3	19.8	19.3	75% Formal, 16% Informal, 8% Work	42% M, 58% F	50% Logical, 33% Both, 17% Emotional
Regular physical activity in childhood but not adulthood	2	1.3	6.5	21.2	19.5	18.0	50% Formal, 50% Informal	50% M, 50% F	100% Emotional

Intermittent childhood physical activity and regular exercise in adulthood	5	4.7	7.0	23.8	19.2	26.0	60% Formal, 20% Functional, 20% Work	60% M, 40% F	40% Logical, 40% Both, 20% Emotional
Intermittent childhood physical activity and does not have regular exercise in adulthood	3	0.7	7.9	23.0	25.5	22.3	33% Formal, 33% Informal, 33% Work	100% F	33% Both, 66% Emotional
No history of regular physical activity in childhood but regular physical activity in adulthood	2	4.0	7.4	34.0	45.0	25.0	50% Informal, 50% Work	100% F	100% Emotional

No history of regular physical activity in childhood or adulthood	5	1.2	8.3	27.7	32.6	26.6	80% Informal, 20% Work	100% F	100% Emotional

Theme 6: Overdoing/obligatory exercise. One of the a priori constructs of interest for this project was "Obligatory exercise" which is a maladaptive pattern of excessive exercise and/or physical activity similar to that seen in some cases of eating disorders. None of the participants in our sample reported or endorsed signs of obligatory exercise. However, an emergent construct was discovered and named "Overdoing" because that is how the participants who reported it referred to it. Three participants reported that they had had at least one period in their lives during which they either became "obsessive" about exercise or were exercising in a context in which most of the people around them seemed obsessive. They described a pattern of overdoing exercise behaviors, as well as having a mental state that is overly focused on physical fitness and perfection. They also reported that either they, and/or the people around them became almost exclusively focused on fitness, diet, and exercise, to the detriment of other important aspects of life.

It was decided to include competitive body building as a part of this theme because although only one of the participants in this sample reported a pattern similar to "overdoing", competitive body builders have a long-documented history of becoming narrowly focused on body image, body size, and diets, supplements, and hydration patterns that will allow them to both build muscle and look more "cut" when in competition (Ravaldi et al., 2003). Table 10 shows data for participants who reported that they are currently avoiding contexts in which "overdoing" is likely to occur, and the three body-builders who were interviewed.

Table 10.

Overdoing (avoidance of) and Body Builder Data

	Triangulation Data								
	n	Average Daily PA	Average Daily Sedentary	Average BMI	% Body Fat	Average Age	Preferred Type	Gender	Emotional Logical
Avoidance of overdoing (including brief history of overdoing)	3	2.9	6.4	21.3	24.3	19.0	33% Informal, 66% Work	100% F	100% Emotional
Body Builders	3	2.2	6.9	28.6	19.3	22.3	100% Formal	100% M	100% Logical

Regarding “overdoing,” “Maria” is an 18-year-old Hispanic woman who was introduced above as a participant who gets most of her physical activity from having physically active employment. She provided the most clearly described example of having a personal experience with “overdoing” both exercise, and the mental state that is overly focused on physical fitness. She also described her subsequent avoidance of people and contexts that might trigger that attitude in her again:

> “I joined a Crossfit gym… I would be working really working hard and live up to the - it’s like a really small gym and they are really serious... I’m sure you’ve heard of Crossfit; it’s super intense… I did it for about six months and I got super attached to it, and I became almost obsessed with it, I had like, that’s when I became that kind of gym person that I didn’t like. I feel like I look at other people and just like, no I don’t want to be that kind of person… once I joined Crossfit, it was like really heavy - all the time - and it was really intense working out. I became obsessed with physique and everything with fitness and training. Yeah, so then I didn’t have time for anything else or have time for other things. I feel like it’s not necessary - that necessary to work out that much.”
>
> "…I like, know those types of people and I don't want to be like that… I'd rather have a social life than go to the gym."
>
> [Re: people at the gym] “They don't even have a normal conversation because they are so obsessed with it. And they're constantly, like, their

whole mindset is changes because they constantly look at other people - 'you don't work out, you do work out' or like 'oh, why are you eating that? … that's gross.'"

[Interviewer: "Well, and what are your ideas on trying to be perfect?"] "I used to be super-obsessed with it, definitely."

It is of interest that two of the three participants who reported avoidance of overdoing went to (different) all-girl's high schools, and a different pair mentioned Crossfit gym attendance in conjunction with overdoing.

"Bill," who was introduced above as one of the people who had intermittent exercise in childhood but is a regular exerciser and body-builder now. He reported that after leaving the military all he wanted to do was body-build, so he decided to return to school for his nutrition degree. He does not have a job, and at this time concentrates on body-building and nutrition, which he considers important to body-building. Is "Bill" someone who "overdoes" or is he simply an avid exerciser? Below, "Bill" describes how carefully he plans his activities, diet, and supplement use in support of his efforts to get bigger:

"Yeah. I mean, absolutely, I try to make sure, as much as possible, that nothing's going to get in the way, and if I can control it, nothing's going to stop me from getting into the gym."

"When I was about 21, I was the same height I am now, about 6'1". I was 150 pounds, so I was a lot thinner than everybody else, so I just wanted to get bigger, get beefier a little bit. That was just the main goal for a lot of

years, was to just get bigger... I didn't care about anything else, about competing or anything. When I really narrowed my focus down to, "I want to get bigger," the goal became - I am tall so I need to get a little bit bigger to compete with these other guys, and to focus on different areas, just critique myself in the mirror, focus on what I need to bring up."

[Asked about whether he uses supplements] "I usually take… protein's the biggest one. When I first started working out, the supplement industry wanted to think that you had to take all these different things. Over time you realize a lot of it you just don't really need it. Protein just for recovery, after I work out. I like to get the… There are some legit people out there that are actually trying to put out quality products and those are the ones that I try to get, it's like everything all in one. Like your branch chain amino acids, your creatine, glutamine, all that stuff in one, take us through before and after."

[Asked about his process before a body-building competition] "A lot of dieting, cardio, really being strict with what I eat, how much of it I eat, trying to lose not too much weight, want to lose about a pound or two pounds a week, at that. Really increase the cardio, slowly, so that the fat loss doesn't plateau. I also try to cycle my carbohydrates, because that seems to be a neat little trick to help the fat loss when you start to plateau. And, since the calorie restriction is part of the process, I try not to push too

hard in the gym, because I'm not getting as much energy in, so I don't injure myself. "

Screening questions for obligatory exercise were included in the initial item pool. We have now added items to assess possible "overdoing" have now been added so that a greater range of physical activity behaviors can be measured.

Theme 7: Sedentary behavior. Sedentary behavior is defined and operationalized as sitting or reclining (not standing or moving major muscle groups). It includes wakeful dozing but excludes sleep. None of the participants recruited for this study reported being completely sedentary, but several do not exercise other than for brief periods of low intensity physical activity as needed for activities of daily living. Further, there is mounting empirical evidence that even if federal minimum recommendations for physical activity are met or exceeded, an excess of sedentary behavior is unhealthy. Epidemiological studies find that less than four hours a day is associated with significant drops in all-cause mortality rates, especially cardiovascular (Warren et al., 2010). Although none of our participants are completely sedentary, all of our participants averaged more than four hours a day, primarily due to having to sit in most of their classes and for homework. Table 11 contains a frequency count and triangulation data for average daily hours of sedentary behavior.

Table 11.

Sedentary Behavior

	Triangulation Data							
Average Daily Hours of Sedentary Behavior	n	Average Daily Hours Physical Activity	Average BMI	Average % Body Fat	Average Age	Preferred Type	Gender	Emotional Logical
10 or more*	2	1.1	24.7	18.0†	25.5	50% Informal, 50% Formal	50% M, 50% F	50% Logical, 50% Emotional
9 - 9.9	3	2.2	27.4	35.1	25.0	33% Work, 66% Informal	100% F	100% Emotional
8 - 8.9	5	2.0	26.3	22.4	23.4	20% Informal, 80% Formal	60% M, 40% F	20% Emotional, 40% Both, 40% Logical
4 - 7.9‡	19	3.4	24.9	24.1	21.9	5% Functional, 15% Work, 32% Informal, 47% Formal	26% M, 74% F	47% Emotional, 26% Both, 26% Logical

Below 4 hours*	0

**Epidemiological studies (cited in "Sedentary Behavior" section above) show that an average of less than 4 hours of sedentary behavior to be optimal for health outcomes, especially as compared to 10 or more hours.*
†This is an unusually low average percent body fat perhaps because one participant is a body builder and the other reported being naturally very slender.
‡This category contains data from 5 participants whose IPAQ self-reported hours of sedentary behavior did not match their interview data, which they suggested they had more sedentary behavior than reported in the IPAQ.

“Bill” was introduced above as a habitual, formal, body-builder who regularly meets and exceeds federal minimum recommendations for physical activity. Interestingly, “Bill” reported the highest daily average of sedentary behaviors of everyone in the sample, with 10.42 average daily hours. When discussing how often he was sedentary or sitting he stated:

> "A lot. If I'm not walking [between classes] I'm pretty much sitting.”
>
> [Asked about favorite leisure activities] “Just chill out at home, maybe I’ll go to the movies with some friends, or go to a play or something. Not too much physical stuff."

“Donna”, who was introduced above as someone who did intermittent exercise in childhood, is the only other participant who reported 10 or more hours of sedentary behavior. She noted:

> “I don’t really do much. I like, never really gain weight, so I don’t ever feel the need to exercise, but I probably should just to stay healthy. I park kind of far from campus, so it takes about 15 minutes to walk to my classes, but I usually take the bus because I’m lazy.”
>
> "I don’t really care for exercising… It’s usually I just never want to, unless we’re going hiking or something fun."

The research on the dangers of excess sedentary behavior is fairly recent, and the findings are not as well disseminated as those of the importance of meeting physical activity

recommendations. The following exchange between the interviewer and 36-year-old intermittent exerciser "Anna" is an example of how otherwise well-educated people may not be aware of the new Federal recommendation to avoid sedentary behavior (Center for Disease control and Prevention, 2017):

Interviewer: "Do you consciously avoid sedentary behavior? Have you gotten into that…?"

"Anna": "What do you mean?"

Interviewer: "Well... there's research out there these days saying that sedentary behavior is not healthy for you - separate from not getting physical activity…"

"Anna": "Oh, gotcha! Do I consciously avoid it?"

Interviewer: "Yeah, some do, some don't."

"Anna": "Ok. It's never something that entered into my mind."

Theme 8: Social support. Social support emerged as highly variable and important theme during the coding process as well. Although it was listed in out coding book from the beginning, it was grouped in an "other factors" category because the main impetus of the study was to be on personal emotional influences on physical activity. However, in interview after interview, a wide variation of preferred (and needed) social support was reported as important to the amount, frequency, intensity, and duration of physical activity sessions. It became clear that social support is strongly interactive with

the emotional patterns that influence physical activity. Research on the effect of social support for physical activity suggests that it is important, but empirical evidence suggests that the types of support that are often expected to help, are not necessarily those that are most effective. For example, in an epidemiological study of social support and physical activity, out of ten forms of social support studied, only general family support, spousal physical activity, and family support for changes in appearance were significantly associated with increased exercise (Booth et al., 2000).

Further, there has been little research on individual variations in social support, especially regarding times when what is considered effective "social support" by one population may actually attenuate physical activity. One common example of this – whether the microculture associated with gyms does or does not facilitate exercise adherence has been studied. For men vs. women, and "adherers" vs. "non-adherers" differences in perceived attitudes of other gym members and treatment of members by staff and other members were found to be significantly different between all of the groups (Pridgeon & Grogan, 2012). As often happens at the beginning stages of a body of research, the findings are not easy to summarize due to differences in definitions, samples, and other methodological issues. In our sample variations in social support that had been noted in previous studies were found and greatly expanded upon. Family support for physical activity has already been addressed in the habit section above. Preference for social support was found to vary not only between groups, but within the individual participant across times. Many participants reported times when social support had both led to increased exercise and facilitated decisions to skip exercise – which led to one or both

people dropping the nascent exercise routine. Table 12 contains percentages of the preferred type of social support for each classification of exerciser. Exercisers who meet or exceed the Federal minimum recommendations generally prefer to exercise by themselves, whereas the highest concentration of people who reported that social support has both facilitated and attenuated their maintenance of exercise are in the category of those who do not regularly exercise. At this point we can only speculate about whether this pattern would generalize, and what explanations there might be.

Table 12.

Social Support Preference Variation

Group	Social Support Preference			
	Prefers to exercise by self	Prefers to exercise with others	Preference changes according to activity type	Preference both facilitated and attenuated average physical activity
Meets-FMR	73%	18%	9%	0%
Near-FMR	14%	43%	29%	14%
Does-not-meet-FMR	9%	27%	18%	46%

"John," the athlete who enjoys sailing and biking, noted that he tends to prefer exercising by himself, because he enjoys being outside and because he often uses exercise as a tool to help him with his Engineering studies. He reported that bike riding, especially, is a facilitator of problem-solving: "a lot of the times I'll figure out whatever I'm stuck on," and stress reduction: "I'll come back less stressed." However, he does often enjoy the social aspects of physical activity:

> But I definitely enjoy the community part. I do a lot of different sailing… so my personal boat at home that I race on my own, it was a one-person boat. This summer, I was asked to race across the Pacific with a group… I really enjoy the community, it's just that the boat I have kind of grown into and chosen is one-person, at home. It's not really, say, a community versus non-community choice. It's more about what the boat is, because it's a really high-performance boat, and that is the direction I'm interested in going. The best platform for me to do that is one person… I mean, I don't necessarily need the community to motivate me, but I enjoy the community.

"Tane," the body builder introduced above reported that the type of exercise seems to make a difference for him. He did note that he and his friends tend to be more into weight-lifting than cardio, so individually they do a minimum amount of cardio whenever they can conveniently schedule it, as opposed to being sure to schedule working out together at the gym 4 – 5 times a week:

> Cardio usually, I found out that I do cardio alone, and I lift weights with friends, so it's kind of different because when you're with friends, you're having fun… When you're with friends, you tend to push each other to the limit. Sometimes. Yeah, it's more enjoyable, I'd say. The other thing with friends, you have your [weight-lifting] partners.

In contrast, "Dan" is an 18-year-old Filipino male who has a history of childhood and adult exercise, is also primarily interested in weight lifting. He is very serious about both exercise and nutrition and is majoring in Nutrition. Although "Dan" enjoys both sedentary (video games) and physical activities (swimming, hiking) with friends, he prefers to do his formal workouts by himself in the gym. When asked what his social support preference was, he stated:

> By myself all the time, really. I really just don't feel the need for a partner most of the time because it just slows me down, and it kind of makes me feel like I've got to coach them through something, coach someone who doesn't really know what to do.

Other interviewees report that social support can both facilitate regular physical activity and be an obstacle to it. Several participants reported that they stopped exercising after a romantic break-up. An even more commonly reported pattern was beginning regular exercise with a friend or romantic partner, but then, because neither party maintained their motivation, they allowed the intention to fade away:

"Taylor," the obese woman who was first introduced in the "Amotivation" section above noted that she and her long-term partner have tried to exercise regularly together several times, but that due to low motivation and busy schedules, these attempts have not resulted in habitual exercise. In fact, there are times when his absence makes exercise easier:

> Sometimes we try. He is also not very active and hasn't ever been very active… his schedule is so unpredictable. On the days off, he just wants to be at home and lazy, which I understand… He works morning one day, and night the next day, and then morning the next day. When he's home, I want to do things with him, and if… Sometimes when he is not home at night, I'll exercise at night. I've been trying to think; I could go to the gym before he gets home at nine, and that wouldn't cut into the time that I get to spend with him. But the reason that I don't do yoga at night most days, or something at night, is because he's home, and I want to spend time with him.

"Taylor" also provided an example of how the decision to exercise with a friend may be both helpful, and a hindrance. She describes one of the longest periods of regular exercise she has ever had was when she was an undergraduate, and she and a friend decided to go together to the gym. They managed to go 2 – 5 times a week for approximately 6 months, but eventually they allowed the habit to drop:

> I was also going with my roommate, and she didn't want to go that day, and I was like, "Well, okay. I don't want to go, either." I remember I

> would get up in the morning, at six or so when we decided we were going to try to go and knock on her door. And if she didn't answer, I would go back to bed. But if she did answer, we would go and stay for an hour or so before classes started that day.

The variety of types, preferences, and effectiveness of social support for physical activity strongly suggests that this is a rich area for future research.

Theme 9: Sudden gain. As discussed earlier, sudden gain in physical activity refers to a sudden shift in attitude, motivation, self-efficacy (perceived ability), a decrease in the amount of self-regulatory effort needed to initiate and maintain regular physical activity, and most importantly, an increase in regularly manifested physical activity behaviors. This is the first time, to this author's knowledge that the construct sudden gain has been researched in the context of exercise or physical activity.

In our interview data, sudden gain is primarily associated with intermittent exercisers; and occurs in people who have made multiple, thus far unsuccessful, attempts to initiate and maintain a physical activity routine. When in a period of sudden gain, the person's attitudes, motivations, ability to effectively use strategies to support continued exercise behavior, and the frequency, duration, and intensity of exercise behavior all rapidly change such that, at least temporarily, a state of automaticity for the decision to engage in physical activity occurs. People in sudden gain periods report that their physical activity-related emotions and behaviors are in sharp contrast to their norm. Instead of feeling low self-efficacy for maintaining their chosen routine, lack of motivation to exercise, or even

plan for and prepare to exercise, they plan for, prepare for, and manifest routine exercise behavior with little need for effortful self-regulation, a few reported aversive emotional reactions to the need to engage in physical activities. The increase in physical activity behavior is maintained significantly longer than the person's norm as well. To meet the coding criteria for this project, participants needed to report having had at least one period of sudden gain that lasted at least two months. This operational definition was created for this study as representing a sufficient period of time to reflect real behavior change. In other words, getting a passing urge to exercise, followed by another period of essentially sedentary behavior is not considered sudden gain. Unfortunately, there is one other common characteristic associated with sudden gain. It fades. All participants (and this author) expressed distress and confusion because after a period of feeling cognitively and emotionally able to maintain regular physical activity, suddenly, in spite of effort and intent, exercise behavior frequency is reported to reduce, then become so irregular that it rarely meets the federal minimum recommended criteria for moderate intensity exercise.

Although the fading of the sudden gain period is distressing to those who experience it, as an illustration that it is possible for a previously sedentary person to relatively suddenly be able to form an important health habit – even temporarily – is encouraging. It suggests that a set of implicit conditions can be created that allow physical activity routine to become habitual and even perhaps enjoyable and automatic.

None of the participants who met criteria for sudden gain were within a sudden gain period at the time of their interviews, as is reflected in Table 13 below. However, their descriptions of how they started (rapidly, impulsively), continued (low self-regulatory

effort) and how their periods of ready exercise behavior ended, all reflected sudden gain coding criteria. It is consistent with the description of sudden gain that all of those who were categorized as such were also considered to be motion-driven exercisers.

Table 13.

Sudden Gain Pattern in Physical Activity

		Triangulation Data							
Group	n	Average Daily Hours Physical Activity	Average Daily Hours Sedentary Behavior	Average BMI	Average % Body Fat	Average Age	Preferred Type	Gender	Emotional Logical
History of Sudden Gain pattern for physical activity	4	0.8	8.0	30.6	40.6	30.8	100% Informal, except in SG, when 100% Formal	100% F	100% Emotional
All other participants	25	3.3	6.8	24.1	21.5	21.1	56% Formal, 20% Informal, 20% Work, 4% Functional	40% M, 60% F	32% Logical, 28% Both, 40% Emotional

As shown in Table 13, participants who have manifested patterns of sudden gain, but are not actively in sudden gain, exercise less than our other participants. Average hours of sedentary behavior are essentially the same as the rest of the sample, but average BMI and average percent body fat are substantially higher. It is of note that although the group average BMI would be classified as indicative of obesity, in this group one participant has a BMI of 18.4; just below the cutoff for “Normal” weight. Another is slightly overweight, and two participants are actually obese as per the CDC BMI weight categories (Centers for Disease Control and Prevention, 2017). This suggests that sudden gain is not exclusively associated only with overweight people.

Representative statements about the rapidity or impulsivity of decisions to start exercising after a long period of no exercise are interesting because while sometimes the decision seems to be made for no reason the participant can figure out, other times the immediate decision seems impulsive, but some type of cumulative change in the salience of exercise may have been occurring:

“Taylor” describing the impulsive way her periods of exercise (some only a few days long, others that last longer than a month, and so qualify as sudden gain) begin, and how they sometimes seem slightly automatic:

> "I do get these, I don’t really know how else to describe them, but "wild hairs" where I’m like, “Okay, I’m going. I’m going to do it.”
>
> “I think that I just saw it as a thing I had to do, like, “That’s what you do at night, so that’s what you’re going to do tonight.”

“Anna” describes a “starting pattern” very similar to Taylor’s:

> "Yeah, but typically it's not a slow build up. Most of the time when I work out it's been like a…" "I decided I’m gonna do it and then I do it… When I started riding my bike with my friends, I decided that I was gonna do it. You know, when I got the gym membership I decided I was gonna do it.”

“Janice” was asked what led up to the decision to start jogging during her longest lasting period of sudden gain, and she describes a pattern suggestive of cumulative effects:

> "Can't remember. I think I just started... it’s usually when I realize how winded I am. Or I'll see a photo of myself and I’m like: ‘Oh my God!’ - and I just… like ‘Gotta start this now. Gotta do this again’ and then so then I start doing stuff, and I'll jog, you know, a little bit - and a little more. and a little more…”

“Blaine” was asked why a recent “impulse” to begin exercising again led to exercise, when so often before those impulses were ignored or led to only one bout of exercise at a time:

> "Maybe this show that I’m watching, like I said, was the tipping point. The main character, she just seems a lot happier, and her posture improves, and her labs improve, and all this stuff goes on. I thought I’d like that. It’s never going to happen if I don’t take a first step, even if I’m already convinced I’m going to fail... trying to get myself in the headspace of having some mastery experiences, and show myself that, just because I

> have a long history of not doing this, doesn't mean I'm the kind of person that doesn't exercise… but the thing that got me inspired right at this particular moment is a TV show that I'm watching [an episode a day for 1 week], which is a Korean soap opera that has somebody losing a lot of weight and getting fit. I don't want to lose weight, but I do want to be fit. That's what pushed me."
>
> "Then, right before I started exercising, it was more impulsive. It was - I emailed [a friend] and agreed [to attend a yoga class]."

This reported pattern sounds cumulative, but it is also impulsive – "Blaine" had only been watching the show for a week, then suddenly she decided to start doing a video workout, and she committed to going to a yoga class with a friend. Blaine also reported having been thinking for a few months of increasing her endurance for the occasional hikes that she was invited to. Why did a tv show that included a subplot about a woman getting into good shape suddenly provide an impetus for "Blaine" when so many other things had not?

"Janice" describing a sudden gain period and the type of automaticity that occurs within a sudden gain period:

> "Yeah, there's been times where I'd get into a habit of jogging… it does kind of get to a point where you're just - when I got home from work, I change into my sweats and I go for a jog. It's not - there's no question as to whether I'm going to do it or not."

“Blaine’s description of her sudden gain lifetime pattern, in response to being asked whether she got much exercise or physical activity in her childhood:

> "No. First time I probably tried to [exercise regularly], well, in college, we had a gym requirement. So, I did yoga classes for that, which I enjoyed, and I think it’s the first time I did something like that, that I enjoyed... Then, after I got out of college, I started working at an office that had a gym, and I tried using that - for maybe a month I did that.”
>
> “…my most consistent exercise in my lifetime was probably the [three] months leading up to my wedding…”

Representative statements that describe the period in sudden gain when the attitudinal, motivational and behavioral effects of sudden gain seem to relatively suddenly fade out:

“Janice,” when asked about her lifetime pattern for exercise described a common pattern at the end of sudden gain periods:

> "Like, I'll get into a routine, and I'll be going to the gym here on campus every day for a couple of months, and then I get derailed one day and it's done for months. Weird."

“Blaine” describing how her longest period of regular exercise gradually ended:

> "Actually… it tapered off. We were just busy, and I just got sick of it, and it got repetitive, and wasn’t as reinforcing to do it anymore."

> "I was mostly just bored with it. I was losing, you know when you first start something, you just have that, ‘This is great!’ I’m imagining how my life is going to be different, and all that stuff. So - I just lost that kind of fire. "

“Taylor” describing her frustration and confusion with her inability to maintain regular exercise after several sudden gain periods in her life that were not maintained:

> "I’ve actually tried to figure it out, honestly. Like, I am a rational person, I know how good exercise is for you - why l am I not doing it? And I think part of it is being self-conscious, part of it is being lazy, and part of it is also that I have physical pains; like, I’ve got bad knees and my back hurts often. And I think that I use those as excuses… So, the rationality thing. My question has always been… ‘This is nuts. If I would stand up and jog in place for 20 minutes, or even 10 minutes, that’s exercise.’”

“Blaine,” who is one of the people who reported having begun an exercise routine in the last week after a long period of no regular exercise, discusses her perception of one of the obstacles to her ability to maintain regular exercise. She describes her difficulty with maintaining all of the changes she needs to make to her lifestyle in order to support regular exercise. When asked what her emotional reaction is to the thought of her scheduled exercise video session tonight she said:

> "I'm a little bit dreading it, and I'm also concerned that I didn't eat enough today. So, if I'm too hungry, I'm not going be up for doing it. So, I'm thinking logistics and the timing, and do I have time to get a snack in before I exercise. " "if you decide you want to be a person who exercises, it requires you to be healthy in a lot of other areas because you need to be well rested, you need to be hydrated, and you need to be fed at regular intervals. Those things are tough too. And then, you need to make the time to do it."
>
> "…when it starts to fade out is - I'll have a few nights where it's just too late, I'm not prepared to do it.:

"Janice" reporting a very rewarding increase in cardiovascular endurance during a sudden gain period, then expressing confusion about why the jogging that she habitually did with little self-regulatory effort during a six-month sudden gain period did not continue:

> "…I noticed once, I was waiting for the bus to get to work and the bus just blew by me; he wasn't looking, and I actually started running and I caught him at the next stop! And I was like 'who? What?' ... It was great! But I don't - why doesn't that feeling keep me going? Why doesn't - why doesn't - like ok, so I got a cold for a week - why don't I start [jogging] again?"

The abrupt changes in emptions, cognitions, and behaviors that characterize the beginning and end of sudden gain periods suggest that some sort of implicit process is

occurring, and that people do not become aware of it until after some sort of catastrophic change occurs. Implicit or pre-conscious processing of motivation is potentially an extremely fruitful area of research for clinical psychologists who hope to improve our ability to facilitate self- and emotional regulation.

Theme/Category 10: Other/of interest. The Other/Of Interest category is self-explanatory; there were several trends or statements of interest to the research group that were not necessarily of use for our current instrument development purposes. Since these are notable, we decided to report them here.

1) Six participants reported that they had just started exercising the week just prior to their appointment for the exercise interview, e.g., after signing up for, and during the time approaching the actual interview. Three of the six are the participants who reported a sudden gain pattern. Unfortunately, because this is not a longitudinal study, we will not be able to find out whether these six participants continue to exercise regularly. It is possible that for those who have difficulty with habitual exercise, a form of social desirability process (e.g., wanting to be able to report exercise) was at work. Alternatively, as noted in Anna's comment below, perhaps other factors are at play.

"Anna" who reported starting exercise the week before her interview, expressed an unexpected reason for why she actually signed up for this study:

> "...I was - like the reason I wanted to come here is like, I wanted to like talk about it, talk, hopefully, like making it [exercise] more salient in my mind."

2) Differences in positive and negative feelings toward exercise. Twenty participants were asked what their positive and negative feelings, emotions and thoughts surrounding exercise were. Unfortunately, three of our most avid, self-regulated exercisers, and two of our more emotionally-driven exercisers were not included in these queries because we did not start them until participant 10.

Positive feelings were queried using a 0 – 10 scale that was anchored with 0 indicating no positive feelings at all and 10 indicating "I love this, I want to do it all the time!" The negative feelings were queried similarly with zero indicating no negative feelings at all, and 10 indicating "I hate this, I never want to do it again!" Both of these questions were asked as regarding how they (on average) during the period before the participant was due to exercise, and how they feel after their exercise session. Table 14 shows the difference scores as categorized by exercise adherence.

Table 14.

Differences in Positive and Negative Feelings Toward Exercise

Physical Activity	n	Average increase in positive emotions after an exercise session	Average decrease in negative emotions after an exercise session
Meets-FMR	6	1.6	-2.1
Near-FMR	6	3.6	-4.6
Does-not-meet-FMR	8	2.4	-2.7
Average	20	2.5	-3.1

In our descriptive data, the difference scores for both positive and negative feelings before and after exercise was greatest for the Near-FMR group. It is possible that variation in the reinforcement provided by changes in positive and negative affect will interact with factors such as habit, social support, and preference for formal vs. informal exercise. Our interview data also suggested that there may be a subgroup of people for whom the aversion to exercise that is felt prior to a scheduled exercise session is so great that the improvement of affect after exercise does not provide sufficient reinforcement to overcome the aversion, but this pattern was only mentioned by two people.

3) Time/Semester effects:

All of the participants in this study reported some degree of needing to adjust their physical activity behavior to work around time constraints, classes, and or the busy times of the semester. Eleven participants reported some degree of reduction of physical activity behaviors during the busiest times of the semester. One 29-year-old graduate student, “Aster,” gets most of her exercise from her 16 hours a week in a service industry job that requires almost constant walking. However, she prefers informal outdoor exercise and tries to schedule it at least once a week:

> "So, I try to schedule one thing a week, if I can. For sure… So, I try to factor it in once a week because it definitely helps. I’d like it to be more but, it’s prioritizing… Except for during finals. Right now, it’s off the table. We’re all just big buckets of stress."

Our most self-regulated (and/or most motivated) participants reported that while they had to take care with their schedules, even in the busiest times of the semester they made sure to get their usual amounts of exercise done. Two avid exercisers noted that they also made sure they got their usual amount of physical activity by scheduling exercise during their study breaks. Further, "John" who is an engineering student and student athlete, stated that he uses the exercise to help his thought processes:

> "For me like, you know, If I'm studying for a midterm, and I'm kind of getting bogged down or slowing down, I'll go for a [bike] ride. I use it to help my studies… I'll lay out a plan for how I'm going to study... and if I'm not making it, that will usually stress me out. And I'll... be usually stuck on something and go for a ride... and a lot of times I'll figure out whatever I'm stuck on, but I'll also come back with a lot less stress. Even if I don't figure it out I will come back less stressed."

Five participants reported that they had sharply reduced their formal physical activity when they started school. Two people stated that the changes in their schedule ever semester caused them difficulties with maintaining habitual physical activity. Some participants thought that they were exercising more regularly than they actually were. "Robert" was introduced above in the Emotionality section as a man whose only formal exercise is one 20 – 40 minute run on Saturday mornings. When we discussed the weeks surrounding midterms and Spring Break, he found that he had missed more exercise than he realized:

Interviewer: "Okay. And so did you run last Saturday?"

Interviewee: "No, I did not."

Interviewer: "Okay. And how about the Saturday before that?"

Interviewee: "No - I didn't run over spring break either – man!"

4) Continuity of sports participation and physical activity

Eight participants reported playing formal sports in high school, only two participants reported deciding to play at the college level. Six of the eight are currently in the Meets-FMR (all exceed FMR) and the remaining two are in the Near-FMR category. A longitudinal study on continuity of physical activity after formal school sports involvement and its interaction with childhood habit and affect could provide useful information.

Inter-rater Reliability.

The derivation of these themes from the interview data was an iterative, and somewhat subjective process. To guard against personal biases, and to increase the reliability of our thematicization process, the principal investigator and the research group did inter-rater reliability on 38% of the transcribed interviews. Research group training for inter-rater reliability was done using 1 or 2 transcripts, depending upon how quickly the research assistant understood the coding process. Inter-rater reliability coding was done on the 4 transcripts that the principal investigator considered to be indicative of a sudden gain pattern, on 3 transcripts in which the pattern of exercise was especially unusual, and on 4 transcripts which were randomly chosen. Further, because several of the themes were derived later in the coding process, earlier transcripts needed to be re-coded for IRR for

the newer themes. Table 15 shows the inter-rater reliability statistics for the nine themes that were used for the process of instrument development.

Table 15.

Inter-rater reliability for themes

Theme	n*	% Agreement	Kappa	Interpretation	Sig
Physical activity variation	11	91%	0.86	Strong	.000
Amotivation	11	100%	1.00	Near Perfect	.001
Automaticity	11	91%	0.74	Moderate	.011
Emotional vs. Logical	8	100%	N/A	Statistic not calculable**	N/A
Formal vs. Informal	6	100%	1.00	Near Perfect	.014
Habit	7	100%	1.00	Near Perfect	.008
Overdoing/Obligatory	8	100%	1.00	Near Perfect	.005
Sedentary Behavior	6	100%	1.00	Near Perfect	.014
Social Support Variation	7	100%	N/A	Statistic not calculable**	N/A
Sudden Gain (Full pattern)	8	88%	0.75	Moderate	.028

**Percent agreement refers to agreement with principal investigator's initial coding; thus, an n of "5" would indicate that a second rater coded 5 transcripts with reference to the construct. ** Cohen's Kappa could not be calculated when one or both raters used the same ratings for each participant (IBM SPSS Version 25).*

Overall Triangulation

The tabular triangulation data that was reported for each theme was consistent with theoretical and literature-based expectations for each physical activity group, e.g., sedentary people tended to have higher average BMI, percent body fat, and weight. Those who reported a history of regular childhood exercise, were more likely to be categorized as Meets-FMR, etc. Overall, theme-based triangulation suggests that interview data are accurately represented.

To assess whether the different sources of data per participant were consistent, the data from each person's qualitative interviews, IPAQ, calculated BMI, and percent body fat were rated as consistent or not consistent with each other. Because of the high variation in the interview data and because of her familiarity with typical error rates for bioelectrical impedance and BMI body composition data, these ratings were done by the principal investigator, using the data base which included the double-coded and/or by-consensus data. If data from all four sources were rated as consistent, as rating of "High" was given. If three of the four were consistent, a rating of "Moderately high" was assigned. If two of the four sources of data were inconsistent, but the other two were consistent a rating of "Moderately low" was given. If two data sources were missing, and/or if there was little consistency between data sources, a rating of "Low" was given. Overall, the majority of participants were rated as "High" or "Moderately high," indicating good participant-based triangulation of the data as seen in Table 16.

Table 16.

Triangulation of Interview, IPAC, % Body Fat, and BMI Data

Quality of Triangulation	n
High; all 4 consistent	13
Moderately high; 3 of 4 consistent	11
Moderately low; 2 of 4 consistent	3
Low; data missing or inconsistent for 3 of 4	2

Refinement of the Initial Item Pool

As research group members were coding and checking for inter-rater reliability, the refinement of the initial 84 item pool was ongoing. In the course of amending the item pool, it grew to 92 items that were administered via SurveyShare, as described in the Method section, to collect further data on the questions' clarity and relevance. A comment box was also provided for each item. If an item was rated as 3 or above in clarity ("clear") and relevance (moderately relevant), but the comments suggested needed changes, each item was reconsidered by the research group. If an item had clarity and relevance ratings of 4 ("very clear" or "very relevant") but had comments suggesting a need to revise, the item was reconsidered but changes were kept to a minimum since its average rating suggested that most respondents found he question to be viable. Table 17 shows how many items were amended.

Table 17.

Item Amendments Derived from Layperson's Refinement Survey Feedback

Category	# Items	Action
Clarity ratings below 3	1	Item deleted
Relevance ratings below 3	0	N/A
Items with a rating of 4 - 5 and no critical feedback	28	No action needed
Items with average clarity ratings of 3 - 4 that were checked due to feedback via comments	54	28 were amended
Items with average clarity rating of 4 - 5 that were checked due to feedback via comments	4	Amended 1 item to eliminate use of the word "lapsed"
Items with average clarity ratings of 3 - 4 and critical feedback via comments that were judged by the research group as being inferior near-duplicates of another item	4	Items were deleted
Exact duplicate item	1	Item deleted
Total retained items	86	

A second analysis of the clarity and relevance ratings was done after categorizing survey participants as exercisers or non-exercisers to assess whether there were systematic differences in the ratings. Participants were categorized according to their answers to two of the survey items: "I habitually do at least moderate intensity exercise or physical activity 3 – 5 times a week for most weeks" and "I don't seem to be able to exercise regularly." All items rated by the divided groups maintained ratings above 3 except for the same item that had a clarity rating below 3 for the undivided sample. Because all items maintained adequate ratings, only those items that for one group had an average rating of 3.0 – 3.9 but an average of 4.0 to 4.9 for the other group were tested for significant differences. Student's unequal variance t-tests were done to compare the averages of 37 ratings. The divided groups' average item ratings were not significantly different from each other except for two items. In both cases the ratings for all groups were between 3.8 and 4.4, which indicates very good clarity or relevance, and so the items will not be amended.

Creation of Questionnaires Ready For Factor Analysis

The fourth step in this project involves creating two questionnaires that are ready to be administered for the purposes of conducting Exploratory Factor Analysis. First, the revised 86-item pool that was refined by the suggestions of both the research group and the Layperson' Refinement Survey is now titled the "Preliminary Amotivation to Automaticity Questionnaire." It is available through SurveyShare and is ready to be administered. The intended purpose of this questionnaire is to allow either a researcher or a clinician to measure a respondent's progression along a continuum of the full range of

physical activity in conjunction with associated behavior patterns. Items are designed to assess both whether habitual physical activity meets federal minimum recommendations, and to measure relevant self-regulatory constructs. Please see Appendix L for a copy of the Preliminary Amotivation to Automaticity Questionnaire.

The second questionnaire is the "Sudden Gain Screener for Physical Activity" and it is intended to be used for research recruitment purposes. This 15-item questionnaire is available on SurveyShare and is ready to be administered for the purpose of collecting data for Exploratory Factor Analysis.

Table 18 contains the items that were designed to assess the themes derived from the literature and from our qualitative data. It is expected that there will be some overlapping factor-loading especially for the themes Amotivation, Sedentary Behavior, and Sudden Gain. The factor loadings will be considered when reducing the number of items by choosing those items that most distinctly assess each theme. However, because the overlapping items may themselves be indicative of a theme, they will be analyzed by the research group for their potential usefulness in later versions of the questionnaire and/or in future research.

Table 18.

Items Created for Measurement of Themes

Theme	Item
Amotivation	I have difficulty with exercising regularly:
	I find it difficult to maintain a regular exercise habit:
	I typically dread the idea of having to attend my next exercise or physical activity session:
	I usually exercise a few times for a week or two, then end up stopping for long periods of time:
	I don't seem to be able to exercise regularly:
	I often intend to exercise, but I usually don't end up doing it:
	I become so physically uncomfortable after a week or two of regular exercise that I tend to stop doing it:
	I can't really think about exercising at this point in my life:
	Exercise takes up so much time that I tend to stop doing it:
	If I am unusually busy my exercise routine is likely to be put on hold:
	I feel stressed about the idea that I will need to exercise several times a week for the rest of my life:
	I am generally relieved when I have a fairly good excuse to skip exercising:
	If I am emotionally distressed, I tend to drop my planned exercise or physical activities:
Automaticity	Exercise is a high priority for me:

Exercise and/or physical activity are such a regular part of my life that I tend to automatically do them:

I am confident that I will be able to maintain a regular exercise habit from now on:

On average, I look forward to and expect to enjoy my next session of exercise/physical activity:

If I am unusually busy, I make it a point to schedule time to exercise:

It doesn't take much self-control for me to exercise or do physical activity of at least moderate intensity for at least 30 minutes, 3 – 5 days a week:

It doesn't take much effort to arrange my schedule, time, gym clothes, etc., for my next exercise or physical activity because I am so used to doing it:

It is easy for me to maintain an exercise/physical activity routine that includes at least 30 minutes of moderately intensive exercise, 3 – 5 days a week:

I feel stressed if I do not exercise several times a week:

I don't really need to think much about getting enough exercise, training, or physical activity; I have done it regularly for a long time:

I don't have to think much about planning for exercise or physical activity each day; it is part of my usual routine:

I have made an overarching decision to exercise or do physical activity regularly, so even though I am sometimes not in the mood, I almost always exercise anyway:

If I can't do my preferred or scheduled type of exercise on the day it was planned, I will find something to replace it so that I will get my day's workout done:

I strongly prefer to be outdoors:

If I am really stressed I find that often I almost *have to* go exercise or do some physical activity:

	I generally prefer to exercise or physical activities out in nature:
	I can't sit still for long; I start to feel as though I have to get up and move:
Maladaptive Thought	I tend to feel that I have to do vigorous exercise or physical activity in order for it to count as exercise:
	I do not currently exercise regularly because… Please check ALL that apply:
	We assume that just about everyone exercised at some point… When you have not been exercising regularly, what are your feelings about starting again? Please check ALL that apply, and add any you feel are needed:
Demographic	I know that exercise and/or doing physical activity is important:
	I know how to exercise or do physical activity safely:
Habit	I have already set a time and day for my next session of exercise or physical activity of at least low – to – moderate intensity for at least 30 minutes:
	Weather permitting, I regularly walk or ride a bike instead of driving to work or school:
	It is easy for me to report how much exercise/physical activity I am getting because it is generally habitual:
	I generally am flexible about my exercise/physical activity plans, and if I can't exercise one day, I always make sure I get the planned amount of physical activity within the same week:
	I plan my exercise schedule well ahead of time:
	I find that it helps me to plan everything I need for my exercise: mealtimes, water intake, clean gym clothes, travel times, etc.:
Habit, longitudinal	I was on a sports team in high school, but I decided not to be on my college sports team:

	I decided not to join varsity team sports at the college level because it is too competitive for me:
Obligatory Exercise/ Overdoing	I do exercise *primarily* because I want to improve how my body looks:
	The only reason to exercise is to stay slender, and I can do that by dieting:
	I want to stay in good shape, but I can sometimes feel myself becoming too obsessive about fitness:
	I sometimes think of almost nothing but diet and exercise:
	I have sometimes had to make myself back away from intensive fitness activity because the time I spent was interfering with other goals:
	I tend to continue to exercise even when a coach or doctor told me to stop to allow a healing period:
Physical Activity Variation	How often have you exercised or done physical activity of at least moderate intensity for at least 30 minutes in the last 3 months:
	How many times have you done exercise or physical activity of at least moderate intensity for at least 30 minutes in the last 7 days, including today:
	I don't like to just jog or walk: I like to have a specific goal, for example: going on a hike or needing to get somewhere:
	I usually do at least moderate intensity exercise or physical activity 3 to 5 times a week, for most weeks:
	I really just want to body build; I know I need to do cardio for my health, but I would prefer to just lift weights:
	I am an athlete in training:

I prefer informal physical activity, such as hiking, riding my bike, or swimming with friends, rather than formal exercise such as weight lifting, jogging, or swimming in competitions:

Sedentary

I spend at least 4 hours of my day sitting in transportation, and/or at work, and/or school, and/or for leisure purposes such as reading or social media:

Most of my usual leisure activities are done sitting: reading, tv/movies, video games, social media, hobbies that require a lot of sitting:

During my daily work schedule, I habitually do things like stand at my desk, or get up and walk frequently, to try to reduce the amount of sitting that I do:

When at work, I spend more than 4 hours a day walking around, for example, as a mail carrier, or a retail salesperson who is required to constantly be on the floor. Please do NOT count time spent primarily standing without walking, for example a cashier who stays behind the register:

After work (or school) is my free time; I don't want to exercise or do physical activities at that time:

When at work, I spend more than 4 hours a day standing without much walking around, for example, as a cashier who stays at the register, or factory line worker:

I typically sit to eat, to do homework, to talk to friends or family

Sudden Gain

I become so annoyed at how much time and planning it takes to exercise or do physical activity regularly that I tend to stop doing it:

I have often felt *guilty* about not developing an exercise habit:

I have often felt *anxious* about not developing an exercise habit:

I have often felt *flawed or inferior* because I have such a hard time developing an exercise habit:

After long periods of *not* doing regular physical activity, at least one time I have impulsively started doing at least 30 minutes of moderate intensity physical activity 3 to 5 times a week, and the regular exercise lasted for at least two months:

After long periods of *not* exercising I have suddenly become strongly motivated to do moderate intensity physical activity 3 to 5 times a week, and the motivation and regular exercise lasted for at least two months:

After long periods of *not* exercising I have suddenly become able to use strategies to do moderate intensity physical activity 3 to 5 times a week, even though these strategies were often ineffective at other times that I tried to use them:

After long periods of *not* exercising I have suddenly developed a more positive attitude and have been able to do moderate intensity physical activity 3 to 5 times a week, for at least two months:

Sometimes I can tell that I will be able to exercise regularly for a month or longer, even though I normally can't maintain an exercise habit:

It annoys me that I am supposed to spend so much time on exercise and/or physical activity:

There have been times when I was exercising regularly but stopped when I got sick for week or two. Then, even though I was no longer sick, I did not start exercising regularly again for at least six months:

There have been times when I was able to maintain motivation and regular exercise for at least two months, and then the motivation just seemed to fade away and I stopped exercising:

I have often been *confused* because I was exercising regularly for at least two months and then I seemed to lose my ability to maintain an exercise habit:

I have often been *distressed* because I was exercising regularly for at least two months and then I seemed to lose my ability to maintain an exercise habit:

I have gone 1 to 6 months without exercising more than 1 time a month:

What is the longest period that you have gone WITHOUT doing at least 30 minutes of moderate (or high) intensity physical activity 3 to 5 days a week (not counting periods of illness or injury)?

	Since age 18 there have been periods of 1 to 6 months long, during which I did not exercise regularly for more than 2 weeks at a time. Then at some point I would feel ready to exercise and would exercise regularly for at least two months in a row.
	Please indicate the LONGEST period of time that you have gone WITHOUT exercising regularly (at least 30 minutes of moderate intensity exercise 3 to 5 days a week). Please do not include time periods before you were in high school, and please do not include times in which you were injured or ill:
	Please indicate the LONGEST period of time that you HAVE exercised regularly (at least 30 minutes of moderate intensity exercise at least 3 to 5 days a week). Please do *not* include *required* high school or college physical education classes. Voluntary exercise classes or voluntary sports training may be included if you attended 3 or more times a week:
Social Support Variation	If I can't go with friends or family, I usually will not exercise or do recreational physical activities:
	I generally prefer to exercise or physical activities alone:
	I like to do some types of exercise alone, but others with friends:
	There have been times that I started exercising regularly because I was doing it with a friend or family member, but then we both kept deciding to skip it and we eventually dropped it:
	I avoid the gym because the social atmosphere there is not usually comfortable for me:

Discussion

Review of Results

The primary impetus of this mixed-methods project was to deepen the understanding of habit-related, cognitive, and emotional influences on people's physical activities and exercise behaviors. This project was designed to include the initial qualitative and quantitative phases in the development of a measure of a broad range of self-regulatory constructs related to the initiation and maintenance of exercise behavior. These instrument development phases included exploratory qualitative interviews, creation and refinement of an initial item pool, collection of qualitative and quantitative data about the clarity and relevance of each item via the Layperson's Refinement Survey, and the creation of two preliminary measurement instruments that are suitable for further psychometric analyses.

Qualitative results. Initially, four constructs derived from literature and previous research by the principal investigator, were of primary interest: amotivation, habit, automaticity, and sudden gain. In addition, the detail and depth of the information received about sedentary behavior and physical activity resulted in the iterative addition or expansion of several themes.

The measurement of sedentary behaviors and exercise and physical activities was much more complex than our largely quantitative literature reviews led us to expect. We found that while people tend to think in detailed terms about their exercise behaviors and motivations, their consideration of informal exercise is less detailed, and most people do

not think in detailed terms about sedentary behavior, if they think about it at all. Further, the traditional queries about intensity, duration, and frequency, which work well for formal exercise, are not as good a fit the measurement of informal activities such as hiking or walking the dog. This issue is recognized in the literature. However, with the growing use of personally carried (or worn) apps for the tracking of movement, steps, distance, and speed, the measure and report of both formal and informal exercise is changing. Thus, thus our data led us to change exercise categorizations from our initial dichotomous category for physical activity (exerciser vs. non-exerciser) to a three-level variable: Meets-FMR, Near-FMR, and Does-not-meet-FMR. Further, coding for preference of type of exercise (formal vs. informal), and for primary source of exercise (formal/informal/work/functional) was added so that our data would reflect current trends in the acceptance of any physical activity as 1) not being sedentary, and 2) to some degree contributing to physical fitness. To better reflect these changes the original "Exercise" theme was renamed "Physical Activity Variation."

The Habit construct was also initially envisioned as a dichotomous variable (habitual physical activity vs non-habitual). However, patterns in participant's reports of their lifelong habitual physical activity behaviors suggested that it would be useful to code for three levels of childhood habit (Regular physical activity, Intermittent childhood physical activity, and No regular childhood physical activity. These categorizations allowed us to illustrate that childhood physical activity history was, in our sample, systematically related to adult physical activity habits.

Social support was originally not considered a primary theme; initially we just coded whether participants mentioned social support, and whether it seemed to facilitate physical activity behavior. However, reports of between group and intrapersonal variations in the preference for, and effectiveness of, different forms of social support led us to add and expand upon this construct.

Another data-driven change involved the idea that one might be getting too much exercise. The proposed questionnaire was designed to assess self-regulatory constructs associated with the full continuum of physical activity behaviors from sedentary to obligatory exercise, e.g., an addictive and/or pathological manifestation of physical activity behaviors. While we did not have any indication of obligatory, or excessive exercisers in our sample, we did have three people who discussed the dangers of "overdoing," including their avoidance of certain authoritarian gym cultures, and of people they perceived as having a vain, perfectionistic, and single-focus emphasis on achieving and maintaining perfect fitness and eating habits.

One other added theme was concerned with whether participant's physical activity behaviors seemed primarily emotionally driven or primarily rationally driven. It was expected that habitual and non-habitual exercisers would have very different emotional presentations. This was often the case, for example, habitual exercisers tend to explain their exercise behavior in terms of logic, e.g., to improve performance, and/or fitness, and to reduce stress, etc., whereas non-exercisers tend to use more emotional language to describe their choices, both when they do and do not exercise. In the case of body builders, although the desire to compete in terms of size and shape (rather than strength

or improved motor performance) may be considered an emotional motivation, the competitive body builders in this sample were consistent with descriptions in the literature, in that they all reported using meticulous logic in their decisions about which exercises the wanted to do, what nutrition they needed to gain and maintain muscle mass, and how to best maintain a lifestyle that allowed them plenty of time to get to the gym regularly (Andersen, Barlett, Morgan, & Brownell, 1995; Mangweth et al., 2001). As is to be expected, non-exercisers report much more variation in their physical activity-related motivation and behaviors than do exercisers. For example, Does-not-meet-FMR participants often reported long periods of ignoring the need to exercise, e.g., remaining sedentary most of the time. They also reported allowing stress or negative emotional fluctuations to cause them to skip intended exercise sessions, which often led to lapses in routine and/or a return to primarily sedentary behavior.

One of the most interesting findings in this project involved unexpected similarities between the participants who exercised regularly and those who did not. Although it was expected that exercisers would report substantially less emotionality in their exercise decisions than did non-exercisers, we found that all of our participants had strong emotional underpinnings of their exercise behaviors. There were, however, primary differences between the groups with regard to how emotion influenced exercise behavior. Those in the Meets-FMR and Near-FMR groups often report strong enjoyment of the activity and/or enjoyment of their improved physical fitness, body shape, or performance (suggestive of intrinsic and integrated motivation). However, the groups who exercise regularly reported much less variation in how much emotion affects their daily exercise

behavior than did the groups who struggled with maintaining habitual exercise. The Meets-FMR respondents typically reported doing all of the forms of exercise they needed for fitness, whether or not they enjoy a particular exercise, although for the types of exercise they dislike they reported doing only the minimum prescribed amount. The respondents in the Near-FMR group reported more emotional effects on what type of exercise they chose to engage in; the Near-FMR group were more likely to report avoidance of the types of exercise they did not like although they maintained at least recommended amounts of their preferred type of exercise. Those in the Does-not-meet-FMR (including sedentary) groups typically reported less overall enjoyment of exercise and physical activity, and they also reported that they allowed emotion or lack of motivation to more frequently and more strongly interfere with whether they would choose to exercise on a daily basis.

Further, all of our participants exceeded an average of four hours of sedentary behavior a day. The daily average sedentary behavior for the full sample (7.0 hours), the average for the Meets-FMR group (6.4), for the Near-FMR group (7.0) and the Does-not-meet-FMR group (7.6) were surprisingly similar and were all well above the epidemiological cutoffs for a sharp increase in mortality related to sedentary behavior (Ford & Casperson 2012; Warren et al., 2010). In our sample this high level of sedentary behavior was reportedly due to the need to sit in class, and while doing homework. It is of interest that although most participants reported more sedentary behaviors during the busiest parts of the semesters, those in the Meets-FMR group were the most likely to maintain their exercise routine throughout the semester, followed by the Near-FMR and then the Does-not-meet-

FMR groups, in that order. It is possible that the strongly habitual and/or strongly emotionally salient nature of the physical activity among the Meets-FMR group may have helped them to maintain their activity levels during their busiest times. As would be expected, the Does-not-meet-FMR group was the most susceptible to report having allowed newly initiated physical activity routines to completely lapse during the busy times of the semester. The fact that sedentary behavior is likely to increase at academically busy times for all groups supports the growing recognition that it is important to include information about sedentary behavior in educational programs about maintaining physical fitness.

Another interesting result of this project is the recognition and development of a sudden gain pattern in physical activity behavior. A subset of four qualitative participants, who report life-long difficulty with initiating and maintaining physical activity, also report that they occasionally have periods of several months during which they are able to maintain a high emotional and cognitive salience of habitual physical activity, accompanied by manifesting physical activity behavior that meets or exceeds the federal minimum recommendations. The durations of these sudden gain periods ranged from 2 months (the defined minimum) to 6 months in this small sample. There is a strikingly wide range of variation both within and between participants with reference to the duration of the sudden gain periods, the social support associated with it, and the types of exercise that were preferred during these periods.

While the exercise/physical activity literature has long recognized the stop-and-start nature of sedentary persons' attempts to develop habitual exercise (Lynch & Main, 1993;

Sherwood, & Jeffery, 2000), and has also begun to report the wider variation of exercise behavior in those who are not habitual exercisers (Matthews, Steven, George, Sampson, & Bowles, 2012), recognition of a sudden gain pattern had not (to this author's knowledge) been previously addressed in the physical activity literature. Participants reported a sudden and unexpected ability to maintain motivation, self-efficacy, planned support behaviors, and most importantly, regular exercise behavior, even after long periods of reported inability to maintain habitual exercise. These periods of low activity levels were reported to have lasted for up to several years; one participant stated that she had only exercised habitually for more than two months at a time three times in her life in spite her almost constant sense of guilt about not exercising and her frequent unrealized intentions to go so. The reported "sudden" ability to begin and maintain habitual exercise when no perceived substantive changes in antecedent behavior or motivation have occurred suggests that pre-conscious cognitive and emotional processes are involved in this decision-making. The pattern reported by our sudden gain participants is very similar to that reported by those who experienced what William Miller called "quantum change," (Miller & C' de Baca, 1994) e.g., a sudden "jump" into what seems to be another state and is also similar to the "crystallization of discontent" that Baumeister claimed is a needed antecedent to lasting change (Baumeister, 1994). Why these sudden gain periods end, rather than tokening the beginning of a lifetime of habitual exercise is not known at this time. The fact that these self-regulatory factors (and the exercise behaviors) are also reported to come to a stop, again for no consciously discernable reason, also suggests that our models of the substrates of habit development and maintenance are missing important

factors. In fact, there is so little study on what allows successful development of life-long habitual exercise to occur for sedentary people that we do not know whether people who show a sudden gain pattern are more, or less, likely to maintain routine exercise than any other group.

Perhaps sudden gain ends because, in those who show this pattern, the emotional, cognitive, and habitual influences on physical activity are not each strong enough to provide support for the development and maintenance of habitual exercise behavior in the face of daily fluctuations in exercise-related motivation and cognition. Possibly without the learning history derived from a multi-year exercise habit to fall back on, and/or without an extremely strong external cognitive support (e.g., diligently engaging in a conscious mental process such as working through the TTM Stages of Change and Behavioral Control strategies, or the Theory of Planned Behavior Implementation Intentions), the nascent habit fades because, for some people, none of these factors remain strong enough to maintain it.

One exciting aspect of the recognition of sudden gain is that it suggests that two areas of research might be fruitful. First, research should examine the wide range of variation in the strength and effectiveness of factors such as attitude, motivation, self-efficacy, and intention in respondents who are sedentary and/or who non-habitually exercise. Such research could provide information on pre-conscious antecedents of emotion, cognition, and physical activity behavior. Although most models such as the Self-Determination Theory's intrinsic to extrinsic continuum, the TransTheoretical Model's Stages of Change, and the Theory of Planned Behavior models acknowledge that people's

motivations and behaviors do not always follow the models in the linear fashion that the model shows, none of these models have a formal factor that acknowledges that, especially for non-exercisers, there is extremely wide variation within their physical activity-related self-regulatory factors and behaviors. Our data preliminarily suggest that people who display the sudden gain pattern may rapidly move from a fairly consistent state of amotivation (lack of self-determination) to an integrated or intrinsic enjoyment of physical activities and then back again. Similarly, they may be in a state of contemplation or have made specific intentions that they are unable to manifest for long periods. Then reportedly, they are suddenly able to put their plans, intentions and strategies into effect, at least temporarily. The sudden gain pattern is of special interest because it may provide clues to why people move from stage to stage, or from low levels of factors such as motivation or perceived behavioral control to sudden high levels. This project is, at best, a first step in addressing the measurement of and the implications of the wide variation in non-exercisers' stop and start behavior. Better ways to measure and address such variation will be the subject of later studies, and perhaps will be built into a model and a measure in the future.

The second potentially fruitful set of implications of sudden gain is that this pattern of behavior suggests that some form of pre-conscious, implicit information processing may be complicit in physical activity-related decision-making. There is a growing literature that suggests that conscious thought is not actively involved in many of the executive functions, such as decision-making, that are typically ascribed to it. In this view, the "products of consciousness" are merely a "passive emergent property of psychological

processing" (Oakley & Halligan, 2017, p. 2). According to this model the created "personal narrative," the consciousness we are aware of, evolved because it allows humans to understand and predict behavior, and it facilitates the development and evolution of culture. Oakley and Halligan's model further suggests that personal awareness exerts no influence on the psychological products created by unconscious processes (Oakley & Halligan, 2017). While it seems implausible to deny all "top-down" conscious cognitive influence on one's own psychological processes and behavior, a model of behavioral change that recognizes the strong influence of pre-conscious processes might help to explain some of the frequent occurrences of relapse in health behaviors and habit formation. Strong pre-conscious influences are certainly consistent with the sudden gain interviewees' reports of first, being surprised that they can suddenly exercise regularly, and then, second, consciously struggling ineffectively with the fading motivation and behavior when the sudden gain pattern ends. Research on change that occurs in a pre-conscious process could be fruitful for basic and clinical research into areas that are traditionally considered resistant to treatment. Such research could inform our understanding of the conscious maintenance of behaviors.

As was mentioned above, many of the significant findings in the studies that use models such SDT (e.g., Rose, Parfitt, & Williams, 2005; Teixeira, Carraça, Markland, Silva, & Ryan, 2012; Thogersen-Ntoumanis & Ntoumanis, 2006) or SOC (e.g., Mullan & Markland, 1997), included participants who endorsed already having high levels of the healthy behaviors being studied. How to effectively create intrinsic or integrated motivation in those who are only extrinsically motivated or who were amotivated is still

essentially unknown. Although Prochaska has done interesting work on how to predict when people will move from stage to stage (Prochaska, 1994), as have others (Plotnikoff, Hotz, Birkett, & Courneya, 2001) there is still a seemingly inherent emphasis on conscious processes, linear behavior change, and a linear time course (allowing for relapses) in the expected psychological changes that herald stage-to-stage movement. The Theory of Planned Behavior, which includes the factors attitude, perceived behavioral control, self-efficacy, intention; and with the addition of the factor "past behavior" (which may be considered a proxy for habit) (Hagger, Chatzisarantis, & Biddle, 2002) is perhaps the most compatible model with the set of constructs that were studied in this project. However, the theory of planned behavior does not directly account for the non-linear variation that can occur in motivation and behavior that are suggested by the present results. It also does not directly address the possibility that pre-conscious factors might influence attitude, perceived behavioral control, or behavior. This is not surprising. As a field, clinical psychology has done very little work incorporating the tenants of implicit learning into clinical treatments. In clinical psychology there are few evidence-based assessments of pre-conscious processing, or more importantly, the factors that lead from pre-conscious processing to the decisions and judgements that may result from it. Further, it is likely that an interaction of several factors influences behavioral regulation. Measurement of an implicitly learned long-lasting cognitive and emotional salience of daily exercise/physical activity and how it interacts with current cognitions and long-term habitual behaviors is an elusive goal. The questionnaire under construction as part of the present study is designed to address some of these gaps in the literature.

Quantitative results. Descriptive statistics were calculated about participants for all of the themes and were presented in tabular form to show differences according to exercise type and other categorizations of interest. Because these qualitative data do not fulfill the fundamental assumptions of independence, representativeness, and normal distributions, inferential statistics were not calculated on differences between groups. Inter-rater reliability was done using Cohen's Kapa statistic, and the majority of inter-rater interpretations were "Strong" or "Near perfect," with only two constructs at "Moderate" (McHugh, 2012).

Layperson's Refinement Survey. The average clarity and relevance ratings, and open-ended comments for items in the Layperson's Refinement Survey were used to refine the original 92-item pool into a new 86-item pool. There were no relevance ratings below 3, and only one item had a clarity rating below 3; it was deleted. Twenty-nine items were amended due to suggestions in the open-ended comments, and 4 items were judged by the research group to be inferior near-duplicates of better-written items and were deleted. One exact duplicate was found by participants and it was deleted.

The participants' item pool response data were not statistically analyzed for trends in behavior, because the primary purpose for the survey was item refinement. However, participants were categorized into exercisers and non-exercisers according to how they answered questions about whether they habitually exercised at FMR, so that the possibility of between group differences for exercisers and non-exercisers' ratings could be assessed. There were only two items that did have statistically significantly different ratings between the two groups, but because the ratings for those two items were all

above 3 (indicating good clarity or relevance) for both exercisers and non-exercisers, neither of the items were amended or removed from the item pool. The new 86-item pool was titled “Preliminary Amotivation to Automaticity Questionnaire” and is suitable for further psychometric research.

Sudden Gain Screener. The items designed to assess sudden gain were used to create a stand-alone research recruitment screener for people more likely to have experienced a sudden gain behavioral pattern. This screener was designed to facilitate recruitment of a sample that is comprised of people who show a pattern of sedentary and/or irregular physical activity behaviors and could be useful in future research targeting those who have difficulty with habitual, sufficient exercise.

Future Research

The “Preliminary Amotivation to Automaticity Questionnaire” ready to be administered online for the purpose of doing factor analyses on how the items load. Further collection of psychometric data are expected to continue as psychometric evaluation and use of the questionnaire in research continues.

Another set of exercise-related topics that might be important for further research 1) social support and 2) childhood exercise habit. As noted in the habit section above, both the literature and the interviewee data gathered in this project suggest that for some people habitual childhood exercise leads to more readily maintaining an adult exercise habit. For others, who reported feeling forced to exercise, it is less clear. Some reported stopping altogether as adolescents but starting again as young adults because they felt

they needed exercise. Others reported that they were having difficulty maintaining the habit because they now dislike exercise. Clarification of the types of childhood habit, how it was enforced, and participant's affective reactions to their childhood exercise experiences are all likely to add important information.

Another potentially important research topic is variation in social support. As noted in the social support section above – social "support" may sometimes be a misnomer – perhaps it should be called social "influence," or social "pressure," since sometimes social interactions seem to reinforce physical activity, but other times (or for different groups of people) it seems to reinforce reducing or stopping exercise behavior. There appears to be almost as much variation in the need for, preference for, and effectiveness of, social support as there is in physical activity behavior.

Other research topics were suggested by patterns noticed by the research group and coded into the "Other" category. This category was created so that we could note trends of interest that were not of direct or immediate use in the development of the proposed questionnaire but could be considered for future studies.

"Time" (e.g., not having enough time to exercise) was not initially added to our list of themes because it is not a personal self-regulatory construct. However, because almost all participants discussed problems with time and being busy, we began to code for whether they mentioned this problem. This is a much-researched topic but our data suggest that the actual time one has available is perhaps less important than is the feeling of stress or pressure that being more busy than usual creates. Many of our Meets-FMR group report

feeling time-related pressures but they maintain their exercise routines by the successful use of a variety of strategies. Our data suggest that personal factors such as habit, using exercise to reduce stress, and a strong personal sense of salience for exercise may be contributing factors for those who maintain exercise, but further studies need to be done to elucidate the effects of time, stress, role strain, and busyness on physical activity behavior.

Our "of interest" category data also suggest the possibility that positive and negative feelings before and after scheduled exercise bouts might vary systematically for exercisers and non-exercisers. This was quantitatively addressed in several of our interviews. We found that there was a pattern of increase of positive feelings and decrease of negative feelings after exercise for all three Physical Activity Variation groups. In our descriptive data, the difference in both positive and negative feelings before and after exercise was greatest for the Near-FMR group. The Near-FMR group is the one that is likely to habitually do the type of exercise they enjoy the most, but not do the types of exercise that they don't like (e.g., they might enjoy jogging outdoors but dislike weight-lifting and so avoid it). It is possible that variation in the reinforcement provided by changes in positive and negative affect will interact with factor such as habit, social support, and preference for formal vs. informal exercise. Our data also suggest that there may be a relationship between aversion to exercise for a subgroup of the Does-not-meet-FMR who report dreading their exercise sessions and having relatively low increases in the positive affect after their sessions.

Another question of interest was whether those who formally played on sports teams throughout high school, but did not play sports at the college level, are more likely than those who did not play sports in high school or college, to maintain FMR throughout their lifespan. What are the differences between those who do maintain FMR and those who become primarily "armchair" enthusiasts? A longitudinal study would be required to answer this question; our cross-sectional data only suggest that our participants who played in high school but not in college are currently in the "Near-FMR and Meets-FMR categories, and they reported the intention to continue to maintain physical fitness.

One last very interesting finding from our present data suggest that the study maladaptive automatic thinking surrounding daily physical activity could be important for interventions to improve physical activity . For example, several of those in the Does-not-meet-FMR group noted that they have difficulty getting up early enough to exercise, yet also have difficulty giving up free time in the evening to exercise. CBT and other evidence-based therapies could address such participants' maladaptive cognitions, for example helping clients redefining their implicit understanding of leisure time as something that begins after the day's exercise, or by reconceptualizing exercise as a form of leisure activity. It is also possible that techniques that improve implicit learning would facilitate a true change in how the person *feels* in the evening when they are faced with the decision of whether to engage in physical activity.

Limitations

As with any study, there are limitations to the ability of the research design and operationalization to completely effectively address the topics of interest. A primary

limitation of this project is that because respondents may not fully understand or be able to articulate the cognitive and emotional processes underlying their behavior, qualitative interview data may not provide complete or accurate information on whether conjectured processes and/or constructs actually account for variance in behavior.

Further, although there was good ethnic diversity in our interview participants, the range of age, physical activity behaviors, and fitness levels were not well-represented by this self-selected sample. Any instrument that is being developed for a general adult population should eventually be tested by using a randomly selected representative sample of the community-based adult population. Since such samples are cost-prohibitive, the initial steps of this instrument development dissertation project were done using data collected from a self-selected convenience sample of University of Hawaii students. A true random representative community sample is needed to assure statistical stability and generalizability. Further, when the revised instrument has been created, studies with specific ethnic, age, and disability status samples will need to be done.

Because there is a growing social emphasis on the importance of exercise and the cost of being unhealthy, some participants who were not normal weight and/or who do not exercise regularly may have avoided self-selecting into the study. Also, it is likely that some participants felt pressured to give answers about exercise and physical activity behaviors that were in alignment with what they felt was more socially desirable. Although the qualitative interview, with its open-ended questions and non-judgmental interviewer, was designed to overcome this issue, there were likely still effects of this type of response bias.

One other limitation of this project is that it is an exploratory project comprised of the initial steps of instrument development an exploratory project, the questionnaire development will be ongoing. Future emphasis will be on recruitment of two sets of respondents: 1) those who are primarily sedentary and those who have a history of unsuccessfully attempting habitual physical activity, and 2) those who tend toward self-reported excessive exercise or fitness behaviors. This is likely to become a growing problem as social trends toward maintaining habitual exercise intensify.

Conclusion

This dissertation project was the first step in an intended program of research on theory and construct development about self-regulatory factors in physical activity. Preparation for the first factor analysis of the initial item pool is currently ongoing. A revised set of qualitative interview questions with a stronger emphasis on intra-personal variation and maladaptive cognition, is being developed. Literature review on pre-conscious processes and implicit learning is also ongoing. It is hoped that psychometric testing of the Amotivation to Automaticity in Adult Physical Activity Questionnaire will facilitate research on effectively supporting people in their efforts to develop life-long physical fitness, and that the theoretical aspects of this and other research into pre-conscious influences on self-regulation will help improve our understanding of behavioral change.

Appendix A: Consent Forms

Qualitative Interview Consent Form

University of Hawai'i

Consent to Participate in Research Project:

Adult Physical Activity Interview Study

My name is Nova Morrisette, MS, and I am a graduate student at the University of Hawai'i at Manoa (UH), in the Department of Psychology. As part of my doctoral dissertation research, I am conducting this interview to explore people's emotions and thinking about regular physical activity. I am asking you to participate in this project because you have expressed an interest in participating in a study about physical activity.

What activities will you do in the study and how long will the activities last? If you participate, I will interview you in person. The interview will last from 20 to 60 minutes. I will record the interview using a digital audio-recorder with a back-up cassette recorder so that I can later type a written record of what we talked about. One example of the type of question I will ask is, "When you think about exercise, what goes through your mind?" If you would like to see a copy of all of the questions that I will ask you, please let me know now.

Benefits and Risks: You will be paid $10.00 for participating in the interview. It is hoped that thinking about your answers will help you understand more about how you think and feel about exercise. The results of this project might help me and other researchers learn more about factors that support or impede regular physical activity in

adults. There is little or no risk to you in participating in this project, but if you feel uncomfortable with any aspect of the interview, you are free to stop at any time. You may also withdraw from the project altogether. If you would like a copy of my final report, please contact me at the email listed near the end of this consent form.

Confidentiality and Privacy: The written records of the interview will not have your name or other identifying information on it, and all information will be kept in a secure location. Only researchers associated with the project will have access to the transcript, and all audio-recordings will be destroyed after transcription. When I report the results of the interview in my typed papers, I will not use your name or any other personal information that would identify you. Instead, I will use a pseudonym (fake name) in place of your name.

Voluntary Participation: Participation in this research project is voluntary. You are free to choose to participate or not to participate in this project. Further, you can choose not to answer specific questions but continue with the rest of the interview. At any point during this project, you can withdraw your permission without any loss of benefits.

Questions: If you have any questions about this project, please contact me via e-mail (novam@hawaii.edu). If you have any questions about your rights in this project, you can contact my Professor, Dr. Janet D. Latner via e-mail at jlatner@hawaii.edu.

If you agree to participate in this project, please sign the following signature portion of this consent form and return it to me.

Please keep the section above for your records.

Tear or cut here

University of Hawai'i

Consent to Participate in Research Project:

Adult Physical Activity Interview Study

Signature(s) for Qualitative Interview Consent:

I agree to join in the research project entitled "Adult Physical Activity Study." I understand that I can change my mind about being in this project, at any time, by notifying the researcher.

Your Name (Print): _____

Your Signature: _____

Witness (print name): _____

Witness (signature): _____

Date: _____

Layperson's Refinement Survey Consent Form

University of Hawai'i

Consent to Participate in Research Project:

Adult Physical Activity: Online Refinement Study.

My name is Nova Morrisette, MS, and I am a graduate student at the University of Hawai'i at Manoa (UHM), in the Department of Psychology. As part of my doctoral dissertation research, I am conducting this research. The purpose of this project is to explore people's emotions and thinking related to physical activity. I am asking you to participate in this project because you are at least 18 years old, you have been enrolled as a student at UH Manoa, and you have expressed an interest in this questionnaire about physical activity.

Project Description – Activities and Time Commitment: If you decide to take part in this project, you will be asked to fill out an online questionnaire. Most of the survey questions are multiple choice. However, there will be a few questions where you can add comments if you choose. The questionnaire will take approximately 20 minutes and completing the survey will be considered to be your consent to participate.

Benefits and Risks: There may be no direct benefit to you for taking part in this project, although it is hoped that thinking about your answers will help you understand more about how you feel and think about exercise. The results of this project might help me and other researchers learn more about factors that support or impede regular physical activity in adults. There is little or no risk to you in participating in this project, but if you

feel uncomfortable with any of the questions, you are free to skip that question and continue with the rest of the survey. You may also withdraw from the project altogether.

Confidentiality and Privacy: I will not ask you for any identifying information, such as your name or address. Please do not include any identifying information in your survey responses.

Voluntary Participation: You can freely choose to take part or to not take part in this survey. There will be no penalty or loss of benefits for either decision. If you do agree to participate, you can stop at any time.

Questions: If you have any questions about this study, please email me at novam@hawaii.edu. You may also contact my adviser, Dr. Janet D. Latner via e-mail at jlatner@hawaii.edu. If you have questions about your rights as a research participant, you may contact the UH Human Studies Program at 808-956-5007 or uhirb@hawaii.edu.

Thank you!

Please print a copy of this page for your records.

Appendix B: Qualitative Recruitment Notice

SONA System Recruitment Description of Qualitative Interview

This study involves a face to face interview about how you feel and think about exercise. It will take from 30 – 60 minutes and is worth 2 points of extra credit. Participants who DO and DO NOT regularly exercise are needed, and we need to interview people of all weights also. Please do not be shy! All information is kept completely confidential.

Appendix C: Qualitative Interview

Qualitative Interview Questionnaire

Participant number _____

Qualitative Interview

Before we get started, do you have any questions about the consent form?

1. **Please lead me through your physical activities in the past week**
    - **a.** Any physical activity counts
        - **i.** Can you tell me about any regularly scheduled exercise/p.a. classes?
        - **ii.** What sort of *regular* physical activity do you do?
            1. Swim at to beach, hike, walk children to school, etc.?
            2. What kind of physical activity does your job require/allow? [GET DESCRIPTION of intensity, frequency & duration] How many minutes a day are spent moving (as opposed to sitting)?
2. **What is your ROUTINE for LEISURE time?**
    - a. How much time in hours per day (not counting sleep) do you spend sitting or reclining?
    - **b.** Home and work count: Sitting, driving, on computer, sitting at work, reclining when not asleep, etc.
        - **i.** Ask about dynamic sitting/standing – intermittent walking on job

c. Do you consciously avoid sitting and reclining, e.g., sedentary behavior?

3. **How normal for you is the week you just described?**
    a. Ask how the last week differs from the average
        i. Sedentary behavior
        ii. Physical activity
4. **When you think of exercise &/or physical activity what sort of thoughts, feelings or emotional reactions do you typically have?**
    a. I am interested in both the ways you *think* about exercise/p.a. and in your *emotional experience* of exercise/p.a.
        i. Query range and average of emotional responses
        ii. What kind of emotions/thoughts might occur when you think about your need to exercise?
        iii. When you have an upcoming exercise/p.a. session (presuming they have ever had an upcoming exercise session)
        iv. What emotions/thoughts might occur when you either MISS, or feel that you should have exercised but did not?
            1. Negative and positive emotions/thoughts when miss?
            2. In what ways do emotional reactions to or thinking about exercise/p.a. influence decisions to *not* exercise?
            3. Have you ever exercised after an injury or an exceptionally vigorous exercise session even though a doctor or coach told you not to?

5. **<u>Tell me about times when it was especially easy for you to do exercise &/or physical activity regularly?</u>**

    a. Listen to them first

        i. Is it usually easy for them to exercise – e.g., do they feel physical or psychological symptoms if they miss a day?

        ii. What is their preferred way to exercise

            1. Has that substantially changed?

    b. Query automaticity:

        i. Times when you automatically seem to do exercise.

        ii. Times when you seem to start exercising w/out really thinking about it

        iii. At these times I felt that I was "just in the mood" to make sure I did what I needed to do to maintain a certain amount of weekly exercise (LOW SELF –REGULATORY EFFORT).

    c. Query sudden shift (positive and negative):

        i. Explanation if needed: There have there been times when I found it easy to exercise regularly – I woke up feeling ok about the idea (ATTITUDE SHIFT), thinking of things I needed to do in order to fit a workout into my day (COGNITIVE SHIFT), times when the fact that exercise is healthy, and part of having my life together (MOTIVATION SHIFT) was enough to help me be sure I kept the regular exercise going for weeks or months.

d. PLANNING & STRATEGIES:
    i. Times when strategies do or do not work?
        1. What kinds of strategies? Different strategies at different times?
        2. Different kinds of social support at different times?
        3. Other strategies? Prep day before? Reward self? Monitor self? Others?
    ii. FLEXIBLE PLANNING
        1. Able and willing to change your plans to be sure that you exercised.
    iii. REINFORCERS?
e. <u>What kinds of patterns of emotions related to exercise have you noticed at these times?</u>

6. **<u>Now, what have been some examples of times when it was particularly difficult for you to do exercise &/or physical activity regularly?</u>**
    a. Explanation if needed: This may refer to times when you have felt your motivation fading and are trying to rekindle it OR it can refer to times when you have not been exercising for at least several weeks and are trying to start again
        i. When you did exercise anyway?
        ii. When you decided not to exercise?
            1. At that time?

b. When you hardly even remember that you need to?

c. When you have not been exercising, what is the range of time that it may take you to start again - A few days, unknown, forever?

7. **<u>What sort of things might have an effect on whether you do exercise &/or physical activity?</u>**

   a. Roles, desire to relax, desire to not have anything you have to do right then, fatigue after children - - don't suggest answers until later, if necessary.

   b. Negative or positive urgency – do you tend to do impulsive things when in negative or positive mood? Tend to avoid exercise or exercise more according to mood?

8. **<u>IF NOT CURRENTLY REGULARLY EXERCISING: If I asked you to be sure to exercise tonight, what are your reactions?</u>**

   a. Internal – emotional? What emotion comes to mind?

      i. Prompts: can't stay that organized, lose interest, procrastinate (e.g., lose interest now, but plan to later), too boring, have a habit of doing other things, forget, etc.

   b. External – busy, too many roles, etc.

      i. Sleep interruption?

      ii. Literally rushing from thing to thing?

      iii. External events cause disorganization?

c. What is your non-work routine? When you are at work, what are you "looking forward to" in your time off?

9. **What haven't I asked you?**

   a. You know you best - What do you think of when you think of exercising regularly?

THANK YOU!

Appendix D: Coding Materials

Initial Thematic Coding Instruction Manual

- Please read the transcript one time without making any notes.
    - This can be done with a digital or printed transcript
- Print out and re-read the transcript, this time highlighting sentences or paragraphs in which you identify one or more significant statements and/or themes.
- A significant statement should be a short, simple, unambiguous phrase or set of sentences that are either of interest (and thus indicate a possible new theme), or that provide evidence supporting an already recorded theme.
- Marks and notes should be clear to another reader. Much information and some good ideas have been lost when abbreviations are re-read and the original author cannot remember what was meant.
- If you feel that there is an "unspoken" or "overarching" theme – e.g., something that is suggested by a cumulative effect of several statements and that cannot be expressed as a simpler theme, note it and list the supporting statements, *but that is not the focus of an initial thematic coding*. Rather than spend a lot of time at this point on an overarching theme, make note of it and present to principal investigator and or research group.
- Return to the digital copy of the transcript.
    - Double check your decision about the theme – could the statement be interpreted in another way?
    - Do not delete or re-order any of the statements on this transcript.

- Example:

1. Please tell me about times when it was especially easy to do physical activity/exercise regularly?

   Um, I think for me, it was easier when I had less things to do. Um, when I wasn't in grad school yet and I'd go to work.

   That's all I'd do – go to work and then exercise.

   Code as (depending on clarifications): Number of obligations, Stable routine, Stress, Role Strain

[ETC]

Example of an Initial Basic Coding Sheet

Construct	Subconstruct	Does the transcript have this subconstruct? YES OR NO
	Does this person move around as a workout, for recreation, or for work, for at least 30 minutes 5 days a weeks at moderate intensity OR if relaxed but not sitting, at least one hour a day (like a beauty salon, waitress, bartender, or relaxed walking).	
Exerciser	1) *"at least moderate intensity,"* it is referring to physical activity that makes you become out of breath, that increases your heart rate, and makes you sweat more than usual. You should be out of breath enough that you can talk, but you should not be able to sing.	
	Does this person exercise regularly => 3 - 5 times a week almost every week as a habit?	
	Intention to exercise, usually can't or doesn't	
	May start exercise, but does not maintain	
	Wants to exercise but can't seem to	
	Knows ought to exercise regularly but can't seem to make self do it	
Amotivation	Has Intellectual motiviation, but emotionally can't do it	
	IS EVIDENCE OF AMOTIVATION PRESENT IN THIS TRANSCRIPT?	
	Does not seem to require much self-regulatory effort to exercise	
	Feels odd or otherwise not right if cannot exercise (move around, be outdoors)	
	Does not have to do much conscious planning; is used to routinely doing exercise	
	The decision was made long ago - this person will exercise even if busy, etc	
Automaticity	This person enjoys exercise/physical activity/sports	
	IS EVIDENCE OF AUTOMATICITY PRESENT IN THIS TRANSCRIPT?	
	Usually not a regular exerciser	
	Often feels guilty or distressed because can't maintain exercise habit	
	At least twice in their life they have suddenly been able to exercise regularly and routinely for at least a month	
	They report that during these times when they are able to exercise regularly they are more motivated to exercise, they dread exercise less, find it easier to make time or get organized, etc.	
Sudden Gain	They may report that after a while the motivation to exercise or the exercise behavior itself seems to stop (may be a trip, or an illness, or an unknown reason, but they stop exercising, even though they wish they would continue)	
	IS EVIDENCE OF SUDDEN GAIN PRESENT IN THIS TRANSCRIPT?	
	Does this person exercise to reduce stress	
	Does this person feel stressed if they don't exercise?	
	Does this person feel stressed if they are supposed to exercise but don't want to?	
Emotion-driven	Does this person seem to have emotion driven exercise or physical activity, rather than logic-driven exercise or physical activity?	
	Evidence of having a primarily LOGICAL or EMOTIONAL drive to exercise?	
	Does this person have a history of exercising with their parents?	
	Does this person have a history of sports involvement?	
	Does this person have a history of NOT exercising or doing regular physical activity?	
History	Does this person have a history of routine exercising or doing regular physical activity?	
	Evidence of a clear history of [Formal or Informal] exercise throughout life or at least from high school on?	
Other	What other patterns or statements of interest have you noticed?	

Example of Last Used Basic Coding Sheet

Construct	Definition/Criteria	Y/N	Comments
Exercise Meets Federal Minimum Recommendation	Does this person move around as a workout, for recreation, or for work, for at least 150 minutes a week, across at least two days a week, at least moderate intensity?		
	Does this person also do two days a week of some type of weight lifting (resistance bands, exercises that use body weights such as pushups or squats are considered weight lifting, as are lifting free or machine weights).		
	NOTE: "at least moderate intensity," refers to physical activity that makes you become out of breath, that increases your heart rate, and makes you sweat more than usual. You should be out of breath enough that you can talk, but you should not be able to sing.		
EVIDENCE THAT PARTICIPANT MEETS FEDERAL MIN REC HABITUALLY:			
Formal or Informal exercise	Does the participant state that they typically prefer formal exercise such as jogging, aerobics classes, lifting weights, doing calisthenics (jumping jacks, pushups, etc.)		
	Does the participant REPORT that they most often do formal exercise (regardless of stated preferences)?		
	Does the participant state that they typically prefer INformal exercise such as hiking, swimming at beach, running with dog, walking/shopping with friends, etc.?		
	Does the participant REPORT that they most often do INformal exercise (regardless of stated preferences)?		

	NOTE: People may report that they do and/or enjoy formal exercise when they are in a period of exercising regularly but then do only informal physical activities after they have stopped formal exercising. If this type of participant reports that they have a hard time maintaining habitual exercise, consider this to be a preference for INformal		
EVIDENCE OF FORMAL OR INFORMAL EXERCISE PREFERENCE:			
Most PA from work	Does the participant work/have a job (work study counts)?		
	Is the job one that requires standing and/or walking, or other non-sitting physical activity?		
	Does the person report more hours of physically active work than non-work physical activity/exercise?		
	NOTE: Those who regularly meet or exceed Federal Minimum Recommendations outside of work, and who also report several hours of physically active work, are NOT to be considered as having work be their primary source of physical activity, since if they stopped working they would still meet the Federal minimum.		
EVIDENCE THAT THEY PERSON GETS MOST OF THE PHYSICAL ACTIVITY/EXERCISE FROM WORK:			
Amotivation	Participant reports intention to exercise, but states that usually can't or doesn't		
	May start exercise, but does not maintain a habit		
	Wants to exercise but can't seem to		
	Knows ought to exercise regularly but can't seem to make self do it		

	Seems to have intellectual motivation, &/or knowledge that needs to exercise/do physical activity but emotionally doesn't follow through		
IS EVIDENCE OF AMOTIVATION PRESENT IN THIS TRANSCRIPT:			
Automaticity	Does not seem to require much self-regulatory effort to exercise		
	Feels odd or otherwise not right if cannot exercise (move around, be outdoors)		
	Does not have to do much conscious planning; is used to routinely doing exercise		
	The decision was made long ago - this person will exercise even if busy, etc.		
	This person enjoys exercise/physical activity/sports		
	Does the person report SOMATIC symptoms when they miss exercise sessions; e.g., feeling antsy, nervous, bloated, sluggish, "icky," fuzzy-headed, etc.		
	If the participant shows automaticity only during periods of Sudden Gain pattern, this should be coded "Temporary Automaticity."		
IS EVIDENCE OF AUTOMATICITY PRESENT IN THIS TRANSCRIPT:			
Emotion/Logic-driven	Does this person exercise to reduce stress?		
	Does this person feel stressed if they don't exercise?		
	Does this person feel stressed if they are supposed to exercise but don't want to?		

	NOTE: What primarily emotion-driven exercise looks like: May do either weight-lifting OR aerobic, but not both because dislikes one. May exercise for relatively brief periods of time then give it up because of boredom or dislike of exercise, may be tired of taking the time, may stop or start because of a romantic break-up, because moved away from familiar place or people, fear of negative social comparison, states that does not exercise because lazy, etc., does not report good self-regulation; e.g., many things may interrupt or stop exercise behaviors.		
	NOTE: What primarily logic-driven exercise looks like: Although the participant may have an overall emotional reason for starting exercise, such as competition, or intense enjoyment of the activity, scheduled exercise, conditioning, and physical activity are maintained even in the face of mood and time fluctuations. Even if a type of exercise is disliked, if it is needed for health or performance, the person will maintain a habit if doing the needed activity.		
EVIDENCE FOR HAVING EITHER A PRIMARILY LOGICAL OR AN EMOTIONAL DRIVE TO EXERCISE:			
History of Childhood Exercise	Does this person have a history of exercising or doing physical activities at least weekly with their parents when living at home?		
	Does this person have a history of sports involvement in middle school or high school, or with city leagues?		
	Does this person have a history of routine exercising or doing regular physical activity since childhood?		

	Category 1) Participant had regular, habitual physical activity &/or sports involvement all through childhood, especially *three* years or more in school or a stable (e.g., not just summer) youth league		
	Category 2) Less and more irregular involvement throughout childhood - this would mean maybe doing things with parents or siblings for one or two periods of at least 6 months in their life AND/OR two years of regular exercise in something like a school sport or an out of school lesson or league AND/OR a report of some personally desired physical activity such as "I have always gone to the beach to swim (not lay out in the sun) at least once a week -- or --		
	Category 3) Very little sports in school (one year or less) and/or fewer outside lessons or youth leagues, such as sports camps that only last 1 to 3 weeks, or out-of-school physical/activity lessons that went on for one year or less and were not replaced with some other long-term physical activity.		

	Did the participant HABITUALLY exercise throughout most of his or her childhood - to the point that they think in terms of exercise/physical activity being the norm for them - if so this would be a category "1." If the person did a good amount on intermittent exercise or physical activity but were not habitual with it for more than two years then that is probably a category "2" - unless they did so much intermittent exercise that they wound up exercising all the time, which might still be a "1" if they mostly met federal minimum requirements. A category "3" would be someone who may have done some exercise/physical activity, but for whom it was pretty clearly not a HABIT except maybe for one year, or for a month or two (or less, e.g., sports camps or weekly lessons for two months, but no daily practice), 2 or 3 times in their lives.		
EVIDENCE OF HISTORY OF CHILDHOOD EXERCISE OR AT LEAST FROM HIGH SCHOOL ON?			
Overdoing/ Obligatory patterns of exercise (Avoiding)	Does the person report avoiding overdoing exercise; stating that they tend to become obsessed, and are currently guarding against doing so?		
	Does the person mention workouts that are so intensive that they cause extreme pain &/or vomiting, &/or severe headache, etc.?		
	Does the person report that exercising has currently or previously taken so much time that they had to avoid other things? Do they report neglecting school or work to exercise? OR do they report avoiding neglect of other life activities by reducing exercise?		

	Does the person report doing exercises to/with an injured body part even though a doctor or coach told them not to? If they do substitute exercises that is ok; i.e., hurt their hand but do not use their hand to exercise.		
EVIDENCE OF OVERDOING OR AVOIDING OVERDOING EXERCISE BEHAVIORS:			
Sedentary (primarily)	Does the participant report that their primary &/or most frequent sources of physical activity are things like walking to and from classes? Housework? Walking from the parking structure of bus stop?		
	Does the person intermittently start and stop exercising, and even when exercising, do they rarely meet both the aerobic and weight-lifting Federal Minimum?		
	Does the person's job involve duties that are, for the most part, done when sitting?		
	Does the person report or imply more than 10 hours a day of sitting behavior (this includes class, homework, leisure activities such as video games, crafting, watching TV or Netflix, driving/commuting, long sitting at meals or when socializing, etc.		
EVIDENCE OF BEING PRIMARILY SEDENTARY:			
Social Support	Social support preferences vary: for example, may report enjoys jogging alone, but prefers to go to gym with friends		
	Social Support effectiveness variation: May start exercising with friend or spouse; both may agree to allow exercise behavior to fade. OR May run farther and faster with several friends, but do better at weightlifting with only one friend, etc.		

	Social comparison: Fear of negative judgement leads to reluctance/refusal to exercise in certain contexts		
	May enjoy social support or specific sport/activity community, but may not need it for maintenance of exercise behaviors		
	Social support from family (childhood or current)?		
	May prefer to exercise alone (or with one other), may be more effective for participant to exercise in a group or class setting		
EVIDENCE OF SOCIAL SUPPORT VARIATION:			
Sudden Gain	Does not maintain habitual exercise at Federal Minimum Recommended levels most of the time		
	Often feels guilty or distressed because can't maintain exercise habit		
	At least twice in their life they have suddenly been able to exercise regularly and routinely for at least a month - usually not longer than 6 months		
	They report that during these times when they are able to exercise regularly they are more motivated to exercise, they dread exercise less, find it easier to make time or get organized, etc.		
	They may report that the motivation to exercise &/or the exercise behavior itself seems to stop (maybe a trip, or an illness, or an unknown reason), and they stop exercising, even though they wish they would continue.		
IS EVIDENCE OF SUDDEN GAIN PRESENT IN THIS TRANSCRIPT?			

Time	Do they say that they don't have enough or as much time to exercise?		
	Do they tend to exercise less during the busy times of the semester, such as midterms and finals?		
	Do they keep up their exercise routine when they are really busy, or do they let it fall away?		
IS EVIDENCE OF TIME PRESENT IN THIS TRANSCRIPT?			
Other/ Of Interest			

Appendix E: International Physical Activity Questionnaire

LONG LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised October 2002.

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE (October 2002)

LONG LAST 7 DAYS SELF-ADMINISTERED FORMAT

FOR USE WITH YOUNG AND MIDDLE-AGED ADULTS (15-69 years)

The International Physical Activity Questionnaires (IPAQ) comprises a set of 4 questionnaires. Long (5 activity domains asked independently) and short (4 generic items) versions for use by either telephone or self-administered methods are available. The purpose of the questionnaires is to provide common instruments that can be used to obtain internationally comparable data on health–related physical activity.

Background on IPAQ

The development of an international measure for physical activity commenced in Geneva in 1998 and was followed by extensive reliability and validity testing undertaken across 12 countries (14 sites) during 2000. The final results suggest that these measures have acceptable measurement properties for use in many settings and in different languages, and are suitable for national population-based prevalence studies of participation in physical activity.

Using IPAQ

Use of the IPAQ instruments for monitoring and research purposes is encouraged. It is recommended that no changes be made to the order or wording of the questions as this will affect the psychometric properties of the instruments.

Translation from English and Cultural Adaptation

Translation from English is encouraged to facilitate worldwide use of IPAQ. Information on the availability of IPAQ in different languages can be obtained at www.ipaq.ki.se. If a new translation is undertaken we highly recommend using the prescribed back translation methods available on the IPAQ website. If possible please consider making your translated version of IPAQ available to others by contributing it to the IPAQ website. Further details on translation and cultural adaptation can be downloaded from the website.

Further Developments of IPAQ

International collaboration on IPAQ is on-going and an ***International Physical Activity Prevalence Study*** is in progress. For further information see the IPAQ website.

More Information

More detailed information on the IPAQ process and the research methods used in the development of IPAQ instruments is available at www.ipaq.ki.se and Booth, M.L. (2000). *Assessment of Physical Activity: An International Perspective.* Research Quarterly for Exercise and Sport, 71 (2): s114-20. Other scientific publications and presentations on the use of IPAQ are summarized on the website. LONG LAST 7 DAYS SELF-ADMINISTERED version of the IPAQ. Revised October 2002.

INTERNATIONAL PHYSICAL ACTIVITY QUESTIONNAIRE

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport. Think about all the **vigorous** and **moderate** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

PART 1: JOB-RELATED PHYSICAL ACTIVITY

The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

1. Do you currently have a job or do any unpaid work outside your home?
_____ Yes
_____ No ***Skip to PART 2: TRANSPORTATION***

The next questions are about all the physical activity you did in the **last 7 days** as part of your paid or unpaid work. This does not include traveling to and from work.

2. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, heavy construction, or climbing upstairs **as part of your work**? Think about only those physical activities that you did for at least 10 minutes at a time.

_____ **days per week**

No vigorous job-related physical activity ***Skip to question 4***

3. How much time did you usually spend on one of those days doing **vigorous** physical activities as part of your work?
_____ **hours per day**
_____ **minutes per day**

4. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads **as part of your work**? Please do not include walking.

_____ **days per week**

No moderate job-related physical activity ***Skip to question 6***

5. How much time did you usually spend on one of those days doing **moderate** physical activities as part of your work?
_____ **hours per day**
_____ **minutes per day**

6. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **as part of your work**? Please do not count any walking you did to travel to or from work.
_____ **days per week**

No job-related walking ***Skip to PART 2: TRANSPORTATION***

7. How much time did you usually spend on one of those days **walking** as part of your work?
_____ **hours per day**
_____ **minutes per day**

PART 2: TRANSPORTATION PHYSICAL ACTIVITY
These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

8. During the **last 7 days**, on how many days did you **travel in a motor vehicle** like a train, bus, car, or tram?
_____ **days per week**

No traveling in a motor vehicle ***Skip to question 10***

9. How much time did you usually spend on one of those days **traveling** in a train, bus, car, tram, or other kind of motor vehicle?
_____ **hours per day**
_____ **minutes per day**

Now think only about the **bicycling** and **walking** you might have done to travel to and from work, to do errands, or to go from place to place.

10. During the **last 7 days**, on how many days did you **bicycle** for at least 10 minutes at a time to go **from place to place**?
_____ **days per week**

No bicycling from place to place ***Skip to question 12***

11. How much time did you usually spend on one of those days to **bicycle** from place to place?
_____ **hours per day**
_____ **minutes per day**

12. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time to go **from place to place**?
_____ **days per week**

No walking from place to place ***Skip to PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY***

13. How much time did you usually spend on one of those days **walking** from place to place?
_____ **hours per day**
_____ **minutes per day**

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY
This section is about some of the physical activities you might have done in the **last 7 days** in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

14. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, chopping wood, shoveling snow, or digging **in the garden or yard**?
_____ **days per week**

No vigorous activity in garden or yard ***Skip to question 16***

15. How much time did you usually spend on one of those days doing **vigorous** physical activities in the garden or yard?
_____ **hours per day**
_____ **minutes per day**

16. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, sweeping, washing windows, and raking **in the garden or yard**?
_____ **days per week**

No moderate activity in garden or yard ***Skip to question 18***

17. How much time did you usually spend on one of those days doing **moderate** physical activities in the garden or yard?
_____ **hours per day**
_____ **minutes per day**

18. Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** activities like carrying light loads, washing windows, scrubbing floors and sweeping **inside your home**?
_____ **days per week**

No moderate activity inside home ***Skip to PART 4: RECREATION,***

SPORT AND LEISURE-TIME PHYSICAL ACTIVITY

19. How much time did you usually spend on one of those days doing **moderate** physical activities inside your home?
_____ **hours per day**
_____ **minutes per day**

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY
This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

20. Not counting any walking you have already mentioned, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?
_____ **days per week**

No walking in leisure time ***Skip to question 22***

21. How much time did you usually spend on one of those days **walking** in your leisure time?
_____ **hours per day**
_____ **minutes per day**

22. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?
_____ **days per week**

No vigorous activity in leisure time ***Skip to question 24***

23. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?
_____ **hours per day**
_____ **minutes per day**

24. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?
_____ **days per week**

No moderate activity in leisure time ***Skip to PART 5: TIME SPENT SITTING***

25. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?
_____ **hours per day**
_____ **minutes per day**

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

26. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?

_____ **hours per day**
_____ **minutes per day**

27. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?

_____ **hours per day**
_____ **minutes per day**

This is the end of the questionnaire, thank you for participating.

Appendix F: Initial Item Pool and Research Group Refinement Materials

Research group: Item Refinement Instructions Handout

Instructions: Please fill out the questionnaire as you normally would except that any time you see any of the following (or other) problems with the questionnaire items, please note it.

Please check for:

- Clarity of the instructions

- Grammatical errors

- Confusing, biased, or ambiguous wording

- 'Loaded' or inflammatory wording

- 'Double-barreled' questions (basically, two questions in one, for example: "I cannot worry about exercise right now because I am concentrating on losing weight". Problems include wanting to say yes to one half of the question, but no to the other, etc.)

- Problems with slang or accidental "bedroom language" (this happened once in reference to a stretching question).

- Misspellings

- Formatting problems

- Answer choices that do not fit

-Any other problem that reduces your ability to meaningfully answer the question

*Also, if there is any concept or question that you think should have been included please note it

THANK YOU!

92-Item Initial Item Pool

1) Exercise is a high priority at this time in my life:

2) I don't seem to be able to exercise regularly:

3) I know that exercise and/or doing physical activity is important:

4) I know the basics of how to exercise or do physical activity safely:

5) On average, I look forward to and expect to enjoy my next session of exercise/physical activity:

6) I find it difficult to maintain a regular exercise habit:

7) I dread the idea of having to attend my next exercise or physical activity session:

8) I usually exercise a few times then end up stopping for long periods of time:

9) I have a preferred type of exercise or physical activity that is the one I do most often:

10) I don't seem to be able to exercise regularly:

11) Exercise and/or physical activity are so much a regular part of my life that I tend to automatically do them:

12) I often intend to exercise, but I usually don't end up doing it:

13) I do not currently exercise regularly because… Please check ALL that apply:

_____ **N/A**, I DO currently exercise regularly

a. _____ I don't have enough time to exercise, shower, dress, etc.

b. _____ It is not safe where I live

c. ____ I just don't like exercise

d. _____ It is too stressful to add another commitment to my schedule

e. _____ I get sore

f. _____ I don’t like getting sweaty

g. _____ I’m too busy with work

h. _____ I’m too busy with care of other family members

i. _____ I have a hard time starting new good habits

j. _____ I don’t really know how to exercise

k. _____ My schedule is too full to allow me to add anything else to it

l. _____ Exercise is more trouble than it is worth

m. ____ I'm so out of shape I can't really exercise

n. _____ I'm not sure why I don't exercise regularly

o. _____ other(s), please list _____

Please put the 4 most important reasons from those checked off above in order with the most important first (use letters):

1: _____

2: _____

3: _____

4: _____

14) I become so physically uncomfortable after a week or two of regular exercise that I tend to stop doing it:

15) I am confident that I will be able to maintain a regular exercise habit from now on:

16) I know that exercise is important, but I need to concentrate on other things first:

17) Exercise is NOT a high priority at this time in my life:

18) I become so annoyed at how much time and planning it takes to exercise or do physical activity regularly that I tend to stop doing it:

19) I can't really think about exercising at this point in my life:

20) We assume that just about everyone exercised at some point… When you have not been exercising regularly, what are your feelings about starting again? Please check ALL that apply, and add any you feel are needed:

_____ **N/A**, I rarely allow more than 2 days to go by without exercising

_____ I am reluctant to make myself that uncomfortable again

_____ I am eager to get going again

_____ It is just back to usual routine

_____ I feel reluctant to start again

_____ I look forward to improving my performance or my ability to function

_____ I feel resentful that I have to exercise

_____ I look forward to relieving some stress by exercising

_____ I look forward to making my body look better

_____ I am frightened that I will not be able to make it a habit

_____ other(s), please list: _____

Please put the 4 most important reasons in order with the most important first (use letters):

1: _____

2: _____

3: _____

4: _____

21) If I am unusually busy, I make it a point to schedule time to exercise:

22) Exercise takes up so much time that I tend to stop doing it:

23) I tend to feel that I have to do vigorous exercise or physical activity in order for it to count as exercise:

24) If I am unusually busy my exercise routine is likely to lapse:

25) I get discouraged because it is so hard to habitually eat right and exercise at the same time:

26) I have already set a time and day for my next session of exercise or physical activity of at least low – to – moderate intensity for at least 30 minutes:

_____ yes

_____ no

27) How often have you exercised or done physical activity of at least low – to – moderate intensity for at least 30 minutes in the last 3 months:

_____ little or none

_____ 1 – 2 times a week, usually

_____ 3 – 4 times a week, usually

_____ 5 or more times a week, usually

28) How many times have you done exercise or physical activity of at least

moderate intensity for at least 30 minutes in the last 7days, including today:

_____ little or none

_____ 1 – 2 times

_____ 3 – 4 times

_____ 5 or more times

29) It doesn't take much self-control for me to exercise or do physical activity (of at least moderate intensity for at least 30 minutes) 3 – 5 days a week:

30) It doesn't take much effort to arrange my schedule, time, gym clothes, etc., for the next day's exercise or physical activity because I am so used to it:

31) It is easy for me to maintain an exercise/physical activity routine that includes at least 30 minutes of moderately intensive exercise, 3 – 5 days a week:

32) I feel very stressed at the idea that I will need to exercise several times a week for the rest of my life:

33) I don't really need to think much about exercise/training/physical activity; I generally do it regularly:

34) I don't have to think about exercise or physical activity; I just do it:

35) I have made an overarching decision to exercise or do physical activity regularly; even though I am sometimes not in the mood, I almost always exercise anyway:

36) I do exercise because I want to improve how my body looks:

37) The only reason to exercise is to stay slender, and I can do that by dieting:

38) It has been very hard for me to try to maintain an exercise/physical activity habit:

39) I spend at least 4 hours of my work or school day sitting:

40) Most of my usual leisure activities are done sitting: TV, reading, movies, video games, social media, hobbies, etc.:

41) Weather permitting, I regularly walk or ride a bike instead of driving to work or school:

42) I try to sit as little as possible:

43) I can't sit still for long; I have to get up and move:

44) I strongly prefer to be outdoors:

45) I can't just jog or walk: I have to be going somewhere:

46) It is easy for me to report how much exercise/physical activity I am getting because it is generally regular:

47) I go long periods of time without exercising:

48) I have gone at 1 – 6 months without exercising or get physical activity of at least moderate intensity for 30 minutes a day, 3 – 5 days a week, for more than two weeks in a row:

49) I have gone at least one year without exercising or get physical activity of at least moderate intensity for 30 minutes a day, 3 – 5 days a week, for more than two weeks in a row:

50) I have had periods of at least a year in which I never exercised regularly for more than two weeks in a row:

51) Sometimes I don't exercise at all for months, then I will exercise regularly for at least two months in a row:

52) Please tell us the LONGEST period of time that you have gone WITHOUT exercising regularly (at least 30 minutes of moderate intensity exercise at least once every three days). Please do not include time periods before you were in high school, and please do not include times in which you were injured or ill:

_____ less than a week

_____ less than a month

_____ 1 – 2 months

_____ 3 – 5 months

_____ 6 months to less than a year

_____ 1 year but less than two years

_____ 2 – 5 years

_____ Over 5 years

53) Please tell us the LONGEST period of time that you HAVE exercised regularly (at least 20 minutes of moderate intensity exercise at least once every three days). Please do not include *required* high school or college physical education classes. Voluntary exercise classes or sports training may be included if you attended 3 or more times a week.

_____ less than a week

_____ less than a month

_____ 1 – 2 months

_____ 3 – 5 months

_____ 6 months to less than a year

_____ 1 year but less than two years

_____ 2 – 5 years

_____ Over 5 years

54) I habitually do at least moderate intensity exercise or physical activity 3 – 5 times a week for most weeks:

55) After work is my free time; I don't want to exercise or do physical activities at that time:

56) I really just want to body build; I know I need to do cardio for healthy heart and lungs, but I would prefer to just lift weights:

57) I love to run; I don't really like to lift weights:

58) I want to stay in good shape, but I can sometimes feel myself becoming obsessive about fitness:

59) I sometimes think of nothing but diet and exercise:

60) I have had to make myself back away from intensive fitness activities because they were interfering with other goals:

61) I tend to continue my regular exercise routine even though a coach or doctor told me to stop to allow a rest period or a healing period:

62) I spend more than 4 hours a day standing at work without doing much walking around, for example, as a cashier or factory line worker:

63) I have often felt *guilty* about not developing an exercise habit:

64) I have often felt *anxious* about not developing an exercise habit:

65) I have often felt *flawed or inferior* about not developing an exercise habit:

66) I have impulsively started exercising or doing physical activity of at least moderate intensity for at least 20 minutes a day, 3 – 5 times a week, for at least two months:

67) One or more times after long periods of not exercising I have suddenly become strongly motivated to exercise or do physical activity of at least moderate intensity for at least 20 minutes a day, 3 – 5 times a week, for at least two months

68) One or more times after long periods of not exercising I have suddenly become able to use strategies to help me maintain exercise, even though these strategies were ineffective at other times that I tried to use them:

69) One or more times after long periods of not exercising I have suddenly had a much more positive attitude about exercise and was able to exercise or do at least moderate intensity physical activity for at least 20 minutes, 3 – 5 times a week, for at least two months:

70) Sometimes I can tell that I will be able to exercise regularly for a while even though I normally I can't maintain an exercise or physical activity habit:

71) I am an athlete in training:

72) I was on a sports team in high school, but I decided not to do be on my college sports team:

73) I don't mind friendly competition but varsity team sports at the college level is too competitive for me:

74) I love friendly team sports, but competitive varsity-level team sports require too much responsibility and create too much pressure:

75) If I can't go with friends or family, I usually will not exercise or do recreational physical activities:

76) I generally prefer to exercise or do physical activities alone:

77) I generally prefer to exercise or do physical activities out in nature:

78) I prefer informal physical activity to formal exercise:

79) It annoys me that I am supposed to spend so much time on exercise and/or physical activity:

80) If I can't do my preferred or scheduled type of exercise on the day it was planned, I will find something to replace it so that I will get my workout done:

81) I love it when I have a good excuse to skip exercising:

82) I plan my exercise schedule well ahead of time:

83) I generally am pretty flexible about my exercise/physical activity plans; if something comes up and I can't exercise I will make sure to get back to my schedule in the coming week:

84) I find that it helps me to plan everything I need for my exercise: mealtimes, clean gym clothes, travel times, etc.:

85) If I am really stressed I find that I *have to* go exercise or do some physical activity:

86) If I am really stressed I am more likely to skip exercise:

87) One or more times after long periods of not exercising I have suddenly become less dependent on things like having a gym membership or having good weather to exercise; the exercising itself becomes more important:

88) If I am emotionally distressed, I tend to drop my planned exercise or physical activities:

89) There have been times when I was exercising regularly, but stopped when I got sick for week or two, then did not start exercising regularly for at least six months:

90) There have been times when I was able to maintain motivation and my exercise habit for two to six months, and then the motivation and exercise just seemed to fade away.

91) I have often felt *confused* because I was exercising regularly for at least two months, and then I seemed to lose my ability to exercise habitually:

92) I generally prefer to exercise or do physical activities in the gym:

Appendix G: Recruitment Notices for Layperson's Refinement Survey

SONA System Recruitment description

This survey is one step in the development of a questionnaire about sedentary behavior, exercise and physical activity, and motivations related to them. You will be asked to answer the questions as you normally would, then for each question you will be asked to tell us whether the question is clearly written and relevant to exercise and physical activity. This study, PART A is separate from PART B. PART A is worth one credit point and if you want more credit you can complete PART B also.

If recruitment through SONA did not result in a sufficient sample size these email messages would have been used:

Initial Invitation to Participate via E-mail with questionnaire link

Hello,

My name is Nova Morrisette, and I am a graduate student at the University of Hawaii at Manoa. I am doing research to help understand why some people find it easy and enjoyable to exercise, and others definitely do not. We are hoping to get your input on this issue so that we can better understand the full range of exercise behavior.

This survey is one step in the development of a questionnaire about sedentary behavior, exercise and physical activity, and motivations related to them. You will be asked to answer the questions as you normally would, then for each question you will be asked to tell us whether the question is clearly written and relevant to exercise and physical activity. This study, PART A is separate from PART B. PART A is worth one credit point and if you want more credit you can complete PART B also.

link

Thank you very much!

Nova Morrisette

Email reminder message

Hello,

We still hope you will help us with our study about attitudes toward exercise! Please go to the link below to access the survey:

Link

Thank you very much!

Appendix H: Layperson's Refinement Survey

Instructions: Thank you for your interest in our study! We are developing a questionnaire and need your point of view on whether the questions are clear and make sense. Please fill out the questionnaire as you normally would except that any time you see any kind of problem with the questionnaire, please note it. Also, if you want to make a comment or if you feel that there are things that should be asked but are not, there will be a comments box at the end of every question – they can be used for anything you would like to say.

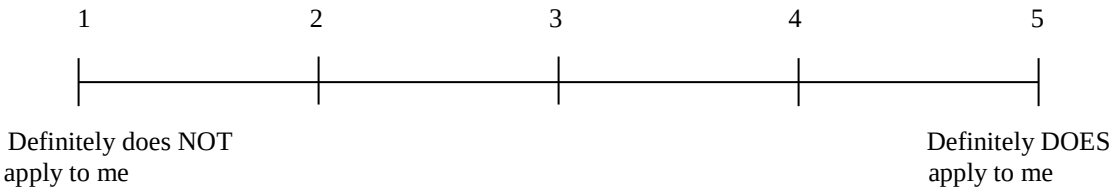
For each question:

1) Please answer the questionnaire items as you normally would
2) Then please answer the questions about each item:
    a. How clear (understandable) is the item?
    b. How relevant to self-control of exercise behavior is the item?
3) Please use the comment box for any comments you have and to note any grammatical or formatting errors, misspelling, or confusing, biased, or ambiguous wording
4) MODERATE INTENSITY: Please note that when the questionnaire asks about exercise or physical activity that is *"at least moderate intensity,"* it is referring to physical activity that makes you become out of breath, that increases your heart rate, and makes you sweat more than usual. You should be out of breath enough that you can talk, but you should not be able to sing.

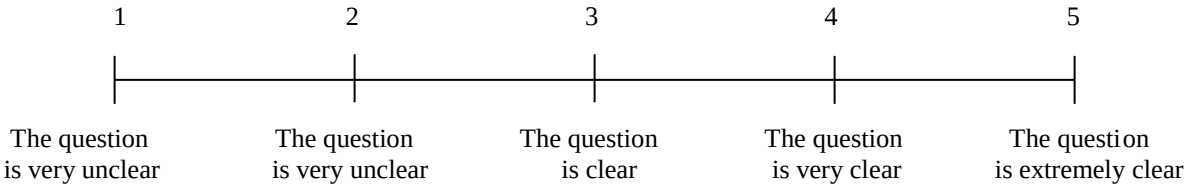
Thank you for participating!

Survey:

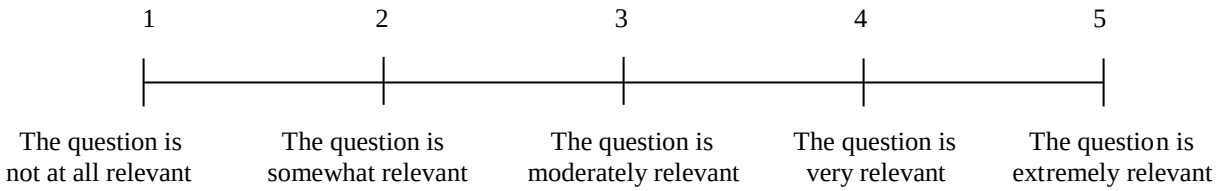
1) I don't seem to be able to exercise regularly:



1a) Please rate the clarity of question 1 – how understandable is it?



1b) Please rate the relevance of question 1 to self-control as applied to exercise or physical activity – how related to exercise or physical activity is the question?



1c) Please use the comment box below for any comments you would like to make, and/or to note any grammatical or formatting errors, misspelling, or confusing, biased, or ambiguous wording in question 1:

[Questions 2 – 92 with clarity, relevance, and comment items followed; pages removed to reduce length of dissertation]

Debriefing:

Hello again – almost done! I expect that you thought that there was a lot of repetition and too many questions. That is because we are looking at how consistently similar questions with different wording were answered & we want to know which wording works best. As we mentioned in the introduction we also wanted to know how understandable and relevant the

questions are. We are studying constructs like the type of exercise people prefer, patterns of exercise, patterns of sedentary behaviors, and emotions related to exercising regularly. We appreciate your input & help.

Thank you!

novam@hawaii.edu

Appendix I: Sudden Gain Screener

Instructions: Please answer each question realistically about your own exercise or physical activity habits. Several of these questions have several parts, for example part 1: "I didn't exercise for long time," and part 2: "then I exercised regularly for at least two months." If ALL parts of the question DO apply to you please indicate that. If ANY parts of the question do NOT apply to you please indicate that the question does not apply.

PLEASE REMEMBER! TO ENSURE THAT YOU RECEIVE CREDIT FOR PARTICIPATION ENTER YOUR SONA ID # IN THE COMMENT BOX OF THE FIRST QUESTION (Question 1 only; there is NO need to put it in any of the other boxes).

Thank you for participating!

1)

PLEASE ENTER YOUR SONA SYSTEM ID NUMBER HERE; this is needed to assign extra credit

2)

I usually exercise a few times, then end up stopping for long periods of time:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

3)

I often intend to exercise, but I usually don't end up doing it:

- Definitely does NOT apply to me

- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

4)

How often have you exercised or done physical activity of at least moderate intensity for at least 30 minutes in the last 3 months:

- little or none
- 1 – 2 times a week, usually
- 3 – 4 times a week, usually
- 5 or more times a week, usually

5)

How many times have you done exercise or physical activity of at least moderate intensity for at least 30 minutes in the last 7 days, including today:

- little or none
- 1 – 2 times a week, usually
- 3 – 4 times a week, usually
- 5 or more times a week, usually

6)

Please indicate the LONGEST period of time that you have gone WITHOUT exercising regularly (at least 30 minutes of moderate intensity exercise 3 to 5 days a week). Please do not include time periods *before* you were in high school, and please do not include times in which you were injured or ill:

- Less than a month
- 1 – 2 months
- 3 – 5 months
- 6 months to less than a year

- 1 year but less than two years
- 2 – 5 years
- Over 5 years

7)

Please indicate the LONGEST period of time that you HAVE exercised regularly (at least 30 minutes of moderate intensity exercise at least 3 to 5 days a week). Please do *not* include *required* high school or college physical education classes. Voluntary exercise classes or voluntary sports training may be included if you attended 3 or more times a week:

- Less than a month
- 1 – 2 months
- 3 – 5 months
- 6 months to less than a year
- 1 year but less than two years
- 2 – 5 years
- Over 5 years

8)

I have often felt *guilty* about not developing an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

9)

I have often felt *anxious* about not developing an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me

- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

10)

I have often felt *flawed or inferior* because I have such a hard time developing an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

11)

After long periods of *not* doing regular physical activity, at least one time I have impulsively started doing at least 30 minutes of moderate intensity physical activity 3 to 5 times a week, and the regular exercise lasted for at least two months:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

12)

After long periods of *not* exercising I have suddenly become <u>strongly motivated</u> to do moderate intensity physical activity 3 to 5 times a week, and the motivation and regular exercise lasted for at least two months:

- Definitely does NOT apply to me

- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

13)

After long periods of *not* exercising I have suddenly become <u>become able to use strategies</u> to help me maintain moderate intensity physical activity 3 to 5 times a week, even though these strategies were often ineffective at other times that I tried to use them:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

14)

After long periods of *not* exercising I have suddenly developed a more <u>positive attitude</u> and have been able to do moderate intensity physical activity 3 to 5 times a week, for at least two months:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

15)

Sometimes I can tell that I will be able to exercise regularly for a month or longer, even though I normally can't maintain an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

16)

There have been times when I was exercising regularly, but stopped when I got sick for week or two. Then, even though I was no longer sick, I did not start exercising regularly again for at least six months:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

17)

There have been times when I was able to maintain motivation and regular exercise for at least two months, and then the motivation just seemed to fade away and I stopped exercising:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

18)

I have often been *confused* because I was exercising regularly for at least two months and then I seemed to lose my ability to maintain an exercise habit:

- Definitely does NOT apply to me

- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

19)

I have often been *distressed* because I was exercising regularly for at least two months and then I seemed to lose my ability to maintain an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

Debriefing:

Thank you! We are doing a study on a specific type of exercise-related behavior and will contact you if there are openings in the study. You will be able to decide at that time whether you wish to participate further.

We appreciate your input -

Thank you!

novam@hawaii.edu

Appendix J: Meaning Clusters

Meaning Clusters
Amotivation
Amount exercise at or above FMR
Amount exercise intermittent and not reliably at FMR
Amount exercise regular but not reliably at FMR
Amount exercise: intermittent primarily sedentary
App used to inspire/track physical activity
Automaticity
Automaticity: Somatic effects when do not exercise: antsy/icky/gross/sluggish/weak/bloated
Avid exerciser
Avoids overdoing
Bigger muscles
Body Image overall
Boredom with exercise
Childhood History of Exercise -
Childhood History of Exercise +
Childhood History of Exercise +/-
Childhood History of overweight
Cumulative cognitive/emotional effect for starting exercise
Diet/eating issues
Emotional reasons start, stop, or vary physical activity; does not maintain FMR
Emotional reasons that may seriously reduce or stop physical activity behavior
Emotional reasons to start, stop, or vary physical activity, but maintains at or above FMR
Emotional reasons will effect what physical activity but it is maintained at or above FMR
Environment/ Environment in Kauai/Lanai/Rural/Beach area
Environment: prefers being outside
Exercise type preferences affect amount and type of physical activity
Exercise type preferences but does all needed exercise types regardless of preference
Exercise type preferred is formal
Exercise type preferred is informal

Flexible planning (maintains daily or weekly amount of exercise in face of obstacles to scheduled exercise session)

Guilt: for not exercising/ not exercising enough/etc.

High School Sports Team roster but chose not to join College sports team

High Self-Regulation

Impulsive physical activity easier

Injury in HS > Got a job > Started college > Reduction in physical activity

Intramural sports (considered or signed up for)

Leisure: exercise felt to be an interruption of leisure or free time

Leisure: favorite activity is Sedentary

Leisure: favorite activity is usually sedentary, but active in specific conditions

Leisure: favorite activity is Active

Mastery experience/self-improvement other than toning/health

Planned physical activity is easier

Resentment/defensiveness when expected to exercise

Romantic situation effect

School effect

Semester changes schedule: exercise maintained

Semester changes schedule: exercise not maintained

Semester Effect: reduction in exercise due to busy at specific times of semester

Social comparison fears lead to reluctance/refusal to exercise in certain contexts

Social support effectiveness variation

Social support nice but not needed

Social support preference variation

Sports/Exercise are a major aspect of life

Stress

Stress - clear head/ help problem solve

Student athlete UH on team roster

Sudden gain

Summer: sharp increase in exercise

Sweat -

Sweat +

Work is primary source of physical activity

Work: PA to the point that gets out of breath and sweaty

Work: required standing with small area walking

Appendix K: Qualitative Participants

Qualitative Participants (n = 29)

ID	Sex	Ethnicity	Age	% Body Fat	FMR	(IPAC) Average Daily Hours Sedentary	Type Exercise	Triangulation
2 "John"	Male	Caucasian	21	15.8	Meets-FMR	8.00	Formal/ Athlete/Avid	High on all 4
4 "Maria"	Female	Mexican American California	18	28.8: Too high, Under hydrated?	Near-FMR	5.20	Informal Intermittent	Moderately low: apparent over-reporting on IPAC. BMI & BF consistent
5	Female	Filipino	18	14.8	Does-not-meet-FMR	6.86	Informal Intermittent	Moderate, exercise too variable

6	Male	Caucasian/ Indian	18	8.5; seems too low for his body type; perhaps over-hydrated	Near-FMR	8.39	Formal	Moderately high for three indicators; body fat too low & walking may have been over-reported re: duration and frequency
7 "Jana"	Female	Filipino	21	18.2	Does-not-meet-FMR	2.60	Informal Intermittent	Moderately low due to high variability of exercise. Body Fat and BMI consistent
8 "Bill"	Male	Mixed	29	18.2	Meets-FMR	10.42	Formal	High on all 4
9 "Tane"	Male	Mixed Asian/ Polynesian	20	18.8	Meets-FMR	4.28	Formal	High on all 4
10 "Janice"	Female	Caucasian	40	51.7	Does-not-meet-FMR	8.90	Formal when in SG, Informal when not	Moderately high because of high variability in exercise

11	Male	Japanese	19	13.4	Near-FMR	5.43	Informal, weekend	High on all 4
12	Female	Caucasian/ Filipino	19	29.5; this seems too high for this slender person; hydration artifact?	Meets-FMR	17.85	Formal	Low, BMI missing, BF too high; visually WNL of weight, only moderate match between interview and IPAC
13	Female	Caucasian	19	24 from memory	Near-FMR	6.93	Informal	Moderately low; IPAC not filled out correctly, % BF from memory
14 "Dan"	Male	Filipino	18	21.5	Meets-FMR	5.78	Formal	High on all 4
15 "Hana"	Female	Japanese/ Chinese	20	23.9	Meets-FMR	5.71	Formal	Moderately high: Interview and Body Fat and BMI consistent

16	Male	Caucasian	20	12.5	Meets-FMR	4.43	Formal	Moderately high; Sedentary Behavior on IPAC low
17 "Anna"	Female	Caucasian	36	40	Does-not-meet-FMR	6.93	Informal Intermittent	High on all 4
18	Female	Japanese	20	18.4	Meets-FMR	8.57	Formal/ Athlete/Avid	High on all 4
19 "Lydia"	Female	Japanese/ Caucasian	42	21.1	Meets-FMR	6.30	Functional	Moderate; Exercise too variable to be easily described on IPAC
20 "Alani"	Female	Hawaiian	19	14.9	Meets-FMR	7.14	Formal	Moderately high: IPAC incorrectly filled out; rest coincide
21	Female	Guam	20	check data sheets	Meets-FMR	2.78	Formal	Moderately high; 3 are consistent, IPAC not

22 "Blaine"	Female	Caucasian	29	25.4	Does-not-meet-FMR	6.80	Formal	High on all 4
23 "Robert"	Male	Filipino	18	17.8	Does-not-meet-FMR	8.64	Formal	High on all 4
24 "Taylor"	Female	Caucasian	28	45.1	Does-not-meet-FMR	9.30	Informal unless in SG, then Formal	High on all 4
25	Female	Multiple Asian/ Hawaiian	20	27.7	Near-FMR	6.70	Informal, Work is primary source	Moderately high; 3 of 4 consistent
26	Male	Filipino	19	18.8	Does-not-meet-FMR	6.86	Formal Intermittent	Low, IPAC and BMI missing
27 "Aster"	Female	Caucasian	29	34.5	Near-FMR	9.30	Informal	High on all 4

28	Male	Japanese	19	16.5	Near-FMR	7.07	Formal	Moderately high; some differences between interview and IPAC
29 "Donna"	Female	Japanese/ Caucasian	22	17.8	Does-not-meet-FMR	10.00	Informal Intermittent	High on all 4
30 "Jia"	Female	Chinese	19	25.8	Does-not-meet-FMR	9.57	Informal Intermittent	High on all 4
31	Female	Filipino	21	55.5	Does-not-meet-FMR	5.40	Intermittent Informal	Moderately high; Exercise too variable, and sedentary behavior not queried

Appendix L: Preliminary Amotivation to Automaticity Questionnaire

Instructions: Please answer each question with reference to how you typically think or feel about the subject.

PLEASE REMEMBER! TO ENSURE THAT YOU RECEIVE CREDIT FOR PARTICIPATION ENTER YOUR SONA ID # IN THE COMMENT BOX OF THE FIRST QUESTION (Question 1 only; there is NO need to put it in any of the other boxes).

Thank you for participating!

1)

PLEASE ENTER YOUR SONA SYSTEM ID NUMBER HERE; this is needed to assign extra credit

2)

I have difficulty with exercising regularly:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

3)

Exercise is a high priority for me:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

4)

I know that exercise and/or doing physical activity is important:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

5)

I know how to exercise or do physical activity safely:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

6)

On average, I look forward to and expect to enjoy my next session of exercise/physical activity:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

7)

I find it difficult to maintain a regular exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

8)

I typically dread the idea of having to attend my next exercise or physical activity session:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

9)

I usually exercise a few times for a week or two, then end up stopping for long periods of time:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

10)

I avoid the gym because the social atmosphere there is not usually comfortable for me:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

11)

I don’t seem to be able to exercise regularly:

- Definitely does NOT apply to me
- Usually does not apply to me

- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

12)

I often intend to exercise, but I usually don't end up doing it:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

13)

Exercise and/or physical activity are such a regular part of my life that I tend to automatically do them:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

14)

I do not currently exercise regularly because… Please check ALL that apply:

- N/A, I DO currently exercise regularly
- I don't have enough time to exercise, shower, dress, etc.
- It is not safe where I live
- I just don't like exercise
- It is too stressful to add another commitment to my schedule
- I get sore
- I don't like getting sweaty
- I'm too busy with work

- ☐ I’m too busy with care of other family members
- ☐ I have a hard time starting new good habits
- ☐ I don’t really know how to exercise
- ☐ My schedule is too full to allow me to add anything else to it
- ☐ Exercise is more trouble than it is worth
- ☐ I'm so out of shape I can't really exercise
- ☐ I am too embarrassed to exercise
- ☐ I do not want to get too bulky, gain too much muscle mass
- ☐ I do not want to get too thin
- ☐ I will not fit gender norms if I exercise
- ☐ I am seriously ill
- ☐ My disability makes it difficult to do most exercises
- ☐ I'm not sure why I don't exercise regularly
- ☐ Other: _____

15)

I become so physically uncomfortable after a week or two of regular exercise that I tend to stop doing it:

- ○ Definitely does NOT apply to me
- ○ Usually does not apply to me
- ○ Sometimes yes, sometimes no
- ○ Usually does apply to me
- ○ Definitely DOES apply to me

16)

I am confident that I will be able to maintain a regular exercise habit from now on:

- ○ Definitely does NOT apply to me
- ○ Usually does not apply to me
- ○ Sometimes yes, sometimes no
- ○ Usually does apply to me
- ○ Definitely DOES apply to me

17)

I become so annoyed at how much time and planning it takes to exercise or do physical activity regularly that I tend to stop doing it:

- ○ Definitely does NOT apply to me
- ○ Usually does not apply to me
- ○ Sometimes yes, sometimes no
- ○ Usually does apply to me
- ○ Definitely DOES apply to me

18)

I can’t really think about exercising at this point in my life:

- ○ Definitely does NOT apply to me
- ○ Usually does not apply to me
- ○ Sometimes yes, sometimes no
- ○ Usually does apply to me
- ○ Definitely DOES apply to me

19)

We assume that just about everyone exercised at some point… When you have not been exercising regularly, what are your feelings about starting again? Please check ALL that apply, and add any you feel are needed:

- ☐ N/A, I rarely allow more than 3 days to go by without exercising
- ☐ I am reluctant to make myself that uncomfortable again
- ☐ I am eager to get going again
- ☐ It is just back to usual routine
- ☐ I feel reluctant to start again
- ☐ I look forward to improving my performance or my ability to function
- ☐ I feel resentful that I have to exercise
- ☐ I look forward to relieving some stress by exercising
- ☐ I look forward to making my body look better
- ☐ I don't like to exercise

- ☐ Other: _____

20)

If I am unusually busy, I make it a point to schedule time to exercise:

- ○ Definitely does NOT apply to me
- ○ Usually does not apply to me
- ○ Sometimes yes, sometimes no
- ○ Usually does apply to me
- ○ Definitely DOES apply to me

21)

Exercise takes up so much time that I tend to stop doing it:

- ○ Definitely does NOT apply to me
- ○ Usually does not apply to me
- ○ Sometimes yes, sometimes no
- ○ Usually does apply to me
- ○ Definitely DOES apply to me

22)

If I am unusually busy my exercise routine is likely to be put on hold:

- ○ Definitely does NOT apply to me
- ○ Usually does not apply to me
- ○ Sometimes yes, sometimes no
- ○ Usually does apply to me
- ○ Definitely DOES apply to me

23)

I tend to feel that I have to do vigorous exercise or physical activity in order for it to count as exercise:

- ○ Definitely does NOT apply to me

- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

24)

I have already set a time and day for my next session of exercise or physical activity of at least low – to – moderate intensity for at least 30 minutes:

- Yes
- No

25)

How often have you exercised or done physical activity of at least moderate intensity for at least 30 minutes in the last 3 months:

- little or none
- 1 – 2 times a week, usually
- 3 – 4 times a week, usually
- 5 or more times a week, usually

26)

How many times have you done exercise or physical activity of at least moderate intensity for at least 30 minutes in the last 7 days, including today:

- little or none
- 1 – 2 times a week, usually
- 3 – 4 times a week, usually
- 5 or more times a week, usually

27)

It doesn't take much self-control for me to exercise or do physical activity of at least moderate intensity for at least 30 minutes, 3 – 5 days a week:

- Definitely does NOT apply to me

- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

28)

It doesn't take much effort to arrange my schedule, time, gym clothes, etc., for my next exercise or physical activity because I am so used to doing it:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

29)

It is easy for me to maintain an exercise/physical activity routine that includes at least 30 minutes of moderately intensive exercise, 3 – 5 days a week:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

30)

I feel stressed about the idea that I will need to exercise several times a week for the rest of my life:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

31)

I typically sit to eat, to do homework, to talk to friends or family typically sit to eat, to do homework, to talk to friends or family:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

32)

I feel stressed if I do not exercise several times a week:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

33)

I don’t really need to think much about getting enough exercise, training, or physical activity; I have done it regularly for a long time:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

34)

I don’t have to think much about planning for exercise or physical activity each day; it is part of my usual routine:

- Definitely does NOT apply to me
- Usually does not apply to me

- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

35)

I have made an overarching decision to exercise or do physical activity regularly, so even though I am sometimes not in the mood, I almost always exercise anyway:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

36)

I do exercise *primarily* because I want to improve how my body looks:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

37)

The only reason to exercise is to stay slender, and I can do that by dieting:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

38)

I spend at least 4 hours of my day sitting at work, and/or school, and/or for leisure purposes such as reading or social media:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

39)

I like to do some types of exercise alone, but others with friends:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

40)

Most of my usual leisure activities are done sitting: reading, tv/movies, video games, social media, hobbies that require a lot of sitting:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

41)

Weather permitting, I regularly walk or ride a bike instead of driving to work or school:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no

- Usually does apply to me
- Definitely DOES apply to me

42)

During my daily work schedule I habitually do things like stand at my desk, or get up and walk frequently, to try to reduce the amount of sitting that I do:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

43)

I can’t sit still for long; I start to feel as though I have to get up and move:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

44)

I strongly prefer to be outdoors:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

45)

I don’t like to just jog or walk: I like to have a specific goal, for example: going on a hike, or going to the store:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

46)

It is easy for me to report how much exercise/physical activity I am getting because it is generally habitual:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

47)

There have been times that I started exercising regularly because I was doing it with a friend or family member, but then we both kept deciding to skip it and we eventually dropped it:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

48)

I have gone 1 to 6 months without exercising more than 1 time a month:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

49)

What is the longest period that you have gone WITHOUT doing at least 30 minutes of moderate (or high) intensity physical activity 3 to 5 days a week (not counting periods of illness or injury)?

- Less than a month
- Less than 3 months
- Less than 6 months
- Less than a year
- Over a year

50)

When at work, I spend more than 4 hours a day walking around, for example, as a mail carrier, or a retail salesperson who is required to constantly be on the floor. Please do NOT count time spent primarily standing without walking, for example a cashier who stays behind the register:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

51)

Since age 18 there have been periods of 1 to 6 months long, during which I did not exercise regularly for more than 2 weeks at a time. Then at some point I would feel ready to exercise, and would exercise regularly for at least two months in a row.

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

52)

Please indicate the LONGEST period of time that you have gone WITHOUT exercising regularly (at least 30 minutes of moderate intensity exercise 3 to 5 days a week). Please do not include time periods *before* you were in high school, and please do not include times in which you were injured or ill:

- Less than a month
- 1 – 2 months
- 3 – 5 months
- 6 months to less than a year
- 1 year but less than two years
- 2 – 5 years
- Over 5 years

53)

Please indicate the LONGEST period of time that you HAVE exercised regularly (at least 30 minutes of moderate intensity exercise at least 3 to 5 days a week). Please do *not* include *required* high school or college physical education classes. Voluntary exercise classes or voluntary sports training may be included if you attended 3 or more times a week:

- Less than a month
- 1 – 2 months
- 3 – 5 months
- 6 months to less than a year
- 1 year but less than two years
- 2 – 5 years
- Over 5 years

54)

I usually do at least moderate intensity exercise or physical activity 3 to 5 times a week, for most weeks:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me

- Definitely DOES apply to me

55)

After work is my free time; I don't want to exercise or do physical activities at that time:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

56)

I really just want to body build; I know I need to do cardio for my health, but I would prefer to just lift weights:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

57)

I want to stay in good shape, but I can sometimes feel myself becoming too obsessive about fitness:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

58)

I sometimes think of almost nothing but diet and exercise:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

59)

I have sometimes had to make myself back away from intensive fitness activities because they were interfering with other goals:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

60)

I tend to continue to exercise even when a coach or doctor told me to stop to allow a healing period:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

61)

When at work, I spend more than 4 hours a day standing without much walking around, for example, as a cashier who stays at the register, or factory line worker:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me

- Definitely DOES apply to me

62)

I have often felt *guilty* about not developing an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

63)

I have often felt *anxious* about not developing an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

64)

I have often felt *flawed or inferior* because I have such a hard time developing an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

65)

After long periods of *not* doing regular physical activity, at least one time I have impulsively started doing at least 30 minutes of moderate intensity physical activity 3 to 5 times a week, and the regular exercise lasted for at least two months:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

66)

After long periods of *not* exercising I have suddenly become <u>strongly motivated</u> to do moderate intensity physical activity 3 to 5 times a week, and the motivation and regular exercise lasted for at least two months:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

67)

After long periods of *not* exercising I have suddenly become <u>become able to use strategies</u> to do moderate intensity physical activity 3 to 5 times a week, even though these strategies were often ineffective at other times that I tried to use them:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

68)

After long periods of *not* exercising I have suddenly developed a more <u>positive attitude</u> and have been able to do moderate intensity physical activity 3 to 5 times a week, for at least two months:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

69)

Sometimes I can tell that I will be able to exercise regularly for a month or longer, even though I normally can't maintain an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

70)

I am an athlete in training:

- Yes
- No

71)

I was on a sports team in high school, but I decided not to be on my college sports team:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

72)

I decided not to join varsity team sports at the college level because it is too competitive for me:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

73)

If I can't go with friends or family, I usually will not exercise or do recreational physical activities:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

74)

I generally prefer to exercise or physical activities alone:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

75)

I generally prefer to exercise or physical activities out in nature:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

76)

I prefer informal physical activity, such as hiking, riding my bike, or swimming with friends, rather than formal exercise such as weight lifting, jogging, or swimming in competitions:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

77)

It annoys me that I am supposed to spend so much time on exercise and/or physical activity:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

78)

If I can't do my preferred or scheduled type of exercise on the day it was planned, I will find something to replace it so that I will get my day's workout done:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

79)

I am always relieved when I have a good excuse to skip exercising:

- Definitely does NOT apply to me
- Usually does not apply to me

- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

80)

I plan my exercise schedule well ahead of time:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

81)

I generally am flexible about my exercise/physical activity plans, and if I can't exercise one day, I always make sure I get the planned amount of physical activity within the same week:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

82)

I find that it helps me to plan everything I need for my exercise: mealtimes, water intake, clean gym clothes, travel times, etc.:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

83)

If I am really stressed I find that often I almost *have to* go exercise or do some physical activity:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

84)

If I am emotionally distressed, I tend to drop my planned exercise or physical activities:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

85)

There have been times when I was exercising regularly, but stopped when I got sick for week or two. Then, even though I was no longer sick, I did not start exercising regularly again for at least six months:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

86)

There have been times when I was able to maintain motivation and regular exercise for at least two months, and then the motivation just seemed to fade away and I stopped exercising:

- Definitely does NOT apply to me

- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

87)

I have often been *confused* because I was exercising regularly for at least two months and then I seemed to lose my ability to maintain an exercise habit:

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

88)

I have often been ***distressed* because I was exercising regularly for at least two months and then I seemed to lose my ability to maintain an exercise habit:**

- Definitely does NOT apply to me
- Usually does not apply to me
- Sometimes yes, sometimes no
- Usually does apply to me
- Definitely DOES apply to me

89)

In what ways are your exercise decisions and activities based on LOGIC?

90)

In what ways are your exercise decisions and activities based on EMOTION?

Debriefing:

Hello again – you are done! You may have noticed a lot of repetition and too many questions. That is because we are looking at how consistently similar questions with different wording were answered & we want to know which wording works best. As we mentioned in the introduction we are studying constructs such as the types of exercise people prefer, patterns of exercise, patterns of sedentary behaviors, and emotions related to exercising regularly. We hope to find ways to help people be able to easily and happily exercise regularly.

We appreciate your input -

Thank you!

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